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For related information see also *Astronautics*.

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89 ASTRONOMY **2169**
Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

90 ASTROPHYSICS **2170**
Includes cosmology; and interstellar and interplanetary gases and dust.

91 LUNAR AND PLANETARY EXPLORATION **2170**
Includes planetology; and manned and unmanned flights.
For spacecraft design see *18 Spacecraft Design, Testing and Performance.* For space stations see *15 Launch Vehicles and Space Vehicles.*

92 SOLAR PHYSICS **2173**
Includes solar activity, solar flares, solar radiation and sunspots.

93 SPACE RADIATION **2176**
Includes cosmic radiation; and inner and outer earth's radiation belts.
For biological effects of radiation see *52 Aerospace Medicine.* For theory see *73 Nuclear and High-Energy Physics.*

GENERAL

99 GENERAL **2177**

Note: N.A. means that no abstracts were assigned to this category for this issue.

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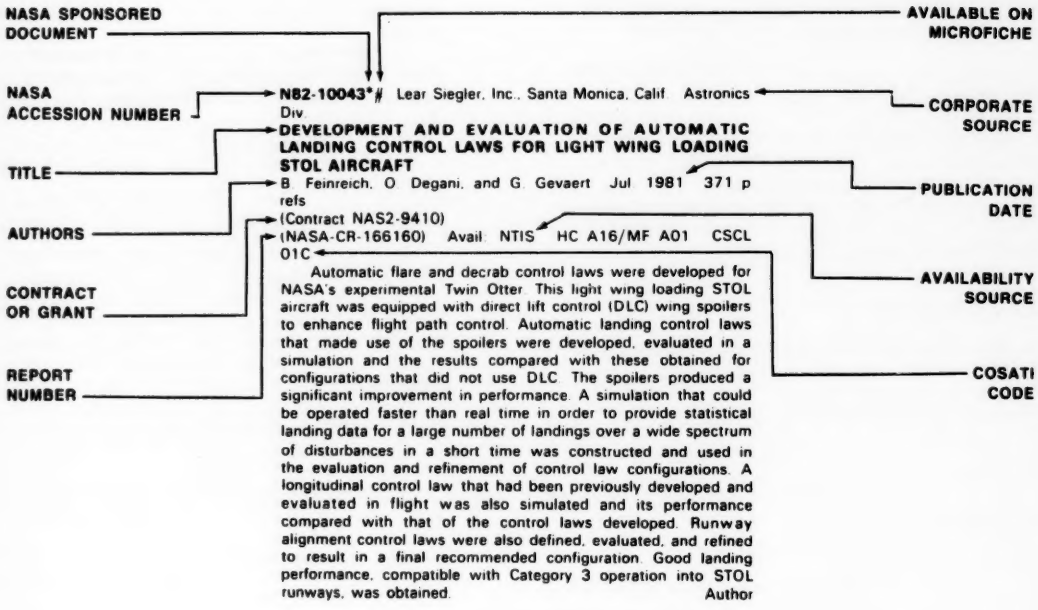
TYPICAL CITATION AND ABSTRACT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N82-10043*# Lear Siegler, Inc., Santa Monica, Calif. Astronics Div
CORPORATE SOURCE
TITLE
DEVELOPMENT AND EVALUATION OF AUTOMATIC LANDING CONTROL LAWS FOR LIGHT WING LOADING STOL AIRCRAFT
PUBLICATION DATE
AUTHORS
B. Feinreich, O. Degani, and G. Gevaert Jul. 1981 371 p refs
(Contract NAS2-9410)
CONTRACT OR GRANT
(NASA-CR-166160) Avail: NTIS HC A16/MF A01 CSCL 01C
AVAILABILITY SOURCE
REPORT NUMBER
COSATI CODE
Automatic flare and decrab control laws were developed for NASA's experimental Twin Otter. This light wing loading STOL aircraft was equipped with direct lift control (DLC) wing spoilers to enhance flight path control. Automatic landing control laws that made use of the spoilers were developed, evaluated in a simulation and the results compared with these obtained for configurations that did not use DLC. The spoilers produced a significant improvement in performance. A simulation that could be operated faster than real time in order to provide statistical landing data for a large number of landings over a wide spectrum of disturbances in a short time was constructed and used in the evaluation and refinement of control law configurations. A longitudinal control law that had been previously developed and evaluated in flight was also simulated and its performance compared with that of the control laws developed. Runway alignment control laws were also defined, evaluated, and refined to result in a final recommended configuration. Good landing performance, compatible with Category 3 operation into STOL runways, was obtained.
Author

VOLUME 20 NUMBER 15/AUGUST 8, 1982

Scientific and Technical Aerospace Reports

A Semimonthly Publication of the National Aeronautics and Space Administration

01 AERONAUTICS (GENERAL)

N82-24161* National Aeronautics and Space Administration, Washington, D. C.
AERONAUTICAL ENGINEERING: A CONTINUING BIBLIOGRAPHY
Apr. 1982 107 p
(NASA-SP-7037(147); NAS 1.21:7037(147)) Avail: NTIS HC $5.00 CSCL 01A

This bibliography lists 347 reports, articles and other documents introduced into the scientific and technical information system. Documents on the engineering and theoretical aspects of design, construction, evaluation, testing, operation, and performance of aircraft (including aircraft engines) and associated compounds, equipment, and systems are included. Research and development in aerodynamics, aeronautics and ground support equipment for aeronautical vehicles are also included. S.L.

N82-24162* National Aeronautics and Space Administration, Washington, D. C.
A CUMULATIVE INDEX TO AERONAUTICAL ENGINEERING: A CONTINUING BIBLIOGRAPHY
Jan. 1982 726 p
(NASA-SP-7037(144); NAS 1.21:7037(144)) Avail: NTIS HC $10.00 CSCL 01A

This bibliography is a cumulated index to the abstracts contained in NASA SP-7037(132) through NASA SP-7037(143) of Aeronautical Engineering: A continuing bibliography. NASA SP-7037 and its supplements have been compiled through the cooperative efforts of the American Institute of Aeronautics and Astronautics (AIAA) and the National Aeronautics and Space Administration (NASA). This cumulative index includes subject, personal author, corporate source, contract, and report number indexes. Author

N82-24163# Naval Postgraduate School, Monterey, Calif.
CANNIBALIZATION OF THE F-14 AND S-3A AIRCRAFT: A VIABLE LOGISTIC M.S. Thesis
Kevin M. Myette Mar. 1981 112 p refs
(AD-A111207) Avail: NTIS HC A06/MF A01 CSCL 05/1

This thesis presents the results of an analysis of cannibalization and its effects on the F-14A and S-3A aircraft. The analysis includes cannibalization measurement methodologies, reasons why squadrons cannibalize, a comparison of fleet cannibalization activity and alternatives to cannibalization. Cannibalization is shown not to be a maintenance practice to be avoided at all cost, but rather a viable cost effective alternative to logistic failures. Additionally, material issue response delays rather than material shortages were found to lead to increased cannibalization. Author (GRA)

N82-24164# Societe Nationale Industrielle Aerospatiale, Toulouse (France). Direction Etudes.
THE AIRBUS FAMILY OF AIRCRAFT AT THE DAWN OF THE 1980'S [LA FAMILLE 'AIRBUS' A L'AUBE DES ANNEES 1980]
G. Broihanns 7 Jan. 1982 9 p In FRENCH Submitted for publication
(SNIAS-821-111-101) Avail: NTIS HC A02/MF A01

The development and marketing of the European Airbus are reviewed. General characteristics of the A-300 B7, already in service, are presented, including flight performance and operational costs. Industrial spin-offs from the project and the impetus to European competitiveness in the field of civil aviation are mentioned. Among ongoing developments and future projects the A-310 aircraft and A-300-600 aircraft are cited.
Author (ESA)

02 AERODYNAMICS

Includes aerodynamics of bodies, combinations, wings, rotors, and control surfaces; and internal flow in ducts and turbomachinery.

For related information see also *34 Fluid Mechanics and Heat Transfer.*

N82-24165*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EXPERIMENTAL AND ANALYTICAL RESULTS OF TANGENTIAL BLOWING APPLIED TO A SUBSONIC V/STOL INLET
Richard R. Burley and Danny P. Hwang 1982 18 p refs Proposed for presentation at the 18th Joint Propulsion Conf., Cleveland, 21-23 Jun. 1982; sponsored by AIAA, SAE and ASME
(NASA-TM-82847; E-1217; NAS 1.15:82847) Avail: NTIS HC A02/MF A01 CSCL 01A

Engine inlets for subsonic V/STOL aircraft must operate over a wide range of conditions without internal flow separation. Experimental and analytical investigations were conducted to evaluate the effectiveness of tangential blowing to maintain attached flow to high angles of attack. The inlet had a relatively thin lip with a blowing slot located either on the lip or in the diffuser. The height and width of these slots was varied. Experimentally determined flow separation boundaries showed that lip blowing achieved higher angle of attack capability than diffuser blowing. This capability was achieved with the largest slot circumferential extent and either of the two slot heights. Predicted (analytical) separation boundaries showed good agreement except at the highest angles of attack. S.L.

N82-24166*# Ohio State Univ., Columbus. Dept. of Aeronautical and Astronautical Engineering.
RIME ICE ACCRETION AND ITS EFFECT ON AIRFOIL PERFORMANCE Ph.D. Thesis. Final Report
Michael B. Bragg Mar. 1982 182 p refs
(Grant NAG3-28)
(NASA-CR-165599; NAS 1.26:165599) Avail: NTIS HC A09/MF A01 CSCL 01A

A methodology was developed to predict the growth of rime ice, and the resulting aerodynamic penalty on unprotected, subcritical, airfoil surfaces. The system of equations governing

the trajectory of a water droplet in the airfoil flowfield is developed and a numerical solution is obtained to predict the mass flux of super cooled water droplets freezing on impact. A rime ice shape is predicted. The effect of time on the ice growth is modeled by a time-stepping procedure where the flowfield and droplet mass flux are updated periodically through the ice accretion process. Two similarity parameters, the trajectory similarity parameter and accumulation parameter, are found to govern the accretion of rime ice. In addition, an analytical solution is presented for Langmuir's classical modified inertia parameter. The aerodynamic evaluation of the effect of the ice accretion on airfoil performance is determined using an existing airfoil analysis code with empirical corrections. The change in maximum lift coefficient is found from an analysis of the new iced airfoil shape. The drag correction needed due to the severe surface roughness is formulated from existing iced airfoil and rough airfoil data. A small scale wind tunnel test was conducted to determine the change in airfoil performance due to a simulated rime ice shape. Author

N82-24167*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

THREE-DIMENSIONAL SEPARATION AND REATTACHMENT

David J. Peake and Murray Tobak Mar. 1982 17 p refs
(NASA-TM-84221; A-8845; NAS 1.15:84221) Avail: NTIS HC A02/MF A01 CSCL 01A

The separation of three dimensional turbulent boundary layers from the lee of flight vehicles at high angles of attack is investigated. The separation results in dominant, large scale, coiled vortex motions that pass along the body in the general direction of the free stream. In all cases of three dimensional flow separation and reattachment, the assumption of continuous vector fields of skin friction lines and external flow streamlines, coupled with simple laws of topology, provides a flow grammar whose elemental constituents are the singular points: the nodes, spiral nodes (foci), and saddles. The phenomenon of three dimensional separation may be construed as either a local or a global event, depending on whether the skin friction line that becomes a line of separation originates at a node or a saddle point. B.W.

N82-24168*# Bihrle Applied Research, Inc., Jericho, N. Y.

F-15 ROTARY BALANCE DATA FOR AN ANGLE-OF-ATTACK RANGE OF 8 DEG TO 90 DEG Final Report

Billy Barnhart Washington NASA May 1982 376 p refs 2 Vol.
(Contract NAS1-16205)
(NASA-CR-3478; NAS 1.26:3478) Avail: NTIS HC A17/MF A01 CSCL 01A

Aerodynamic characteristics obtained in a rotational flow environment, utilizing a rotary balance are presented in plotted form for a 1/12 scale F-15 airplane model. The configurations tested included the buildup of airplane components and the basic airplane with various control deflections. Data are presented for all configurations without analysis for an angle of attack range of 8 to 90 deg, and clockwise and counterclockwise rotations covering an omega b/2V range from 0 to 0.4. Selected configurations are presented over an extended omega b/2V range from 0 to 0.9. S.L.

N82-24169*# Bihrle Applied Research, Inc., Jericho, N. Y.

ROTARY BALANCE DATA FOR AN F-15 MODEL WITH CONFORMAL FUEL TANKS FOR AN ANGLE-OF-ATTACK RANGE OF 8 DEG TO 90 DEG Final Report

Billy Barnhart Washington NASA May 1982 377 p refs 2 Vol.
(Contract NAS1-16205)
(NASA-CR-3516; NAS 1.26:3516) Avail: NTIS HC A17/MF A01 CSCL 01A

Aerodynamic characteristics obtained in a rotational flow environment, utilizing a rotary balance, are presented in plotted form for a 1/12 scale conformal fuel tank equipped F-15 airplane model. The configurations tested included in the buildup of airplane components and the basic airplane with various control deflections. Data are presented for all configurations without analysis for an angle of attack range of 8 to 90 deg, and clockwise and counterclockwise rotations covering an omega b/2V range from 0 to 0.4. Selected configurations are presented over an extended omega b/2V range from 0 to 0.9. S.L.

N82-24170*# Marquette Univ., Milwaukee, Wis. Dept. of Mechanical Engineering.

FEASIBILITY OF OBSERVER SYSTEM FOR DETERMINING ORIENTATION OF BALLOON BORNE OBSERVATIONAL PLATFORMS

Nicholas J. Nigro and J. C. Gagliardi [1982] 119 p refs
(Grant NAG1-65)
(NASA-CR-168945; NAS 1.26:168945) Avail: NTIS HC A06/MF A01 CSCL 01A

The instantaneous orientation (i.e., the attitude) of the LACATE instrumentation platform with respect to a local vertical is discussed. An observer model for predicting the orientation of balloon-borne research platforms is described. Determination of the platform orientation as a function of time is addressed. N.W.

N82-24171*# Marquette Univ., Milwaukee, Wis. Coll. of Engineering.

EFFECT OF WIND GUSTS ON THE MOTION OF A BALLOON-BORNE OBSERVATION PLATFORM

Nicholas J. Nigro and Frank M. Johanek [1982] 69 p refs
(Grant NAG1-65)
(NASA-CR-168947; NAS 1.26:168947) Avail: NTIS HC A04/MF A01 CSCL 01A

The effect of wind gusts on the magnitude of the pendulation angles of a balloon-borne observation platform is determined. A system mathematical model is developed and the solution of this model is used to determine the magnitude of the observation platforms pendulation angles. S.L.

N82-24172*# National Aeronautics and Space Administration, Washington, D. C.

HIGH-SPEED AERODYNAMICS SCIENTIFIC TRANSACTIONS NO. 19

G. F. Telenin, ed. Apr. 1982 251 p refs Transl. into ENGLISH of "Aerodinamika Bolshikh Skorostey" Moscow, 1972 p 1-151 Transl. by Agence Tunisienne de Public Relations, Tunis, Tinisia. Original doc. prep. by Inst. of Mechanics, Moscow State Univ.
(Contract NSF-C-504)
(NASA-TM-76907; NAS 1.15:76907; TT-77-55073) Avail: NTIS HC A12/MF A01 CSCL 01A

High speed aerodynamics are studied in relation to the flow of perfect gases. Viscous gas flows are also studied as are stability loss and self oscillations in a flow. Numerical investigations of various two dimensional and three dimensional problems of external aerodynamics are presented. S.L.

N82-24173*# National Aeronautics and Space Administration, Washington, D. C.

SCIENTIFIC TRANSACTIONS NO. 11 OF THE INSTITUTE OF MECHANICS, MOSCOW STATE UNIVERSITY

A. L. Gonor, ed. Apr. 1982 195 p refs Transl. into ENGLISH of Nauchn. Tr. (Moscow), no. 11, 1971 p 1-137 Transl. by Franklin Book Programs, Inc., Cairo
(Contract NSF-C-724)
(NASA-TM-76908; NAS 1.15:76908) Avail: NTIS HC A09/MF A01 CSCL 01A

The results of flow around wings, the determination of the optimal form, and the interaction of the wake with the accompanying flow at supersonic and hypersonic speeds of the free-stream flow are given. Methods of numerical and analytical calculation of one dimensional unsteady and two dimensional steady motions of fuel-gas mixtures with exothermic reactions are also considered. Author

N82-24174*# National Aeronautics and Space Administration, Washington, D. C.

SUCCESSIVE SMOOTHING ALGORITHM FOR CONSTRUCTING THE SEMIEMPIRICAL MODEL DEVELOPED AT ONERA TO PREDICT UNSTEADY AERODYNAMIC FORCES

D. Petot and H. Loiseau Mar. 1982 47 p Transl. into ENGLISH of "Algorithme de Lissages Successifs pour la Recherche du Modele Semiempirique de Prevision des Forces Aerodynamiques Instationnaires Developpe a l'ONERA" Rept. RT-12/184-RY-08OR ONERA, Chatillon, France, Jul. 1981

p 1-30, 57-68 Transl. by Kanner (Leo) Associates, Redwood City, Calif.
(Contract NASw-3541)
(NASA-TM-76681; NAS 1.15:76681) Avail: NTIS HC A03/MF A01 CSCL 01A

Unsteady aerodynamic methods adopted for the study of aeroelasticity in helicopters are considered with focus on the development of a semiempirical model of unsteady aerodynamic forces acting on an oscillating profile at high incidence. The successive smoothing algorithm described leads to the model's coefficients in a very satisfactory manner. Author

N82-24175*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
AN ASSESSMENT OF A MODIFIED POTENTIAL FLOW CODE FOR CALCULATING THE EFFECT OF SMALL GEOMETRIC CHANGE ON THE PRESSURE AND FORCES OF SUPERCRITICAL AIRFOILS
Raymond M. Hicks May 1982 32 p refs
(NASA-TM-84227; A-8861; NAS 1.15:84227) Avail: NTIS HC A03/MF A01 CSCL 01A

Wind-tunnel test data for two closely related supercritical airfoils were compared with calculations obtained from a nonconservative, potential flow code over a Mach number range from 0.20 to 0.80. The potential flow code includes an iterated, integral boundary-layer correction. The theoretical pressure distributions correlated more closely with the experimental pressure distributions when the flow was entirely subsonic or subsonic with a small supersonic zone than when the flow contained a large supersonic zone. The predicted drag level was below the experimental values at nearly all test conditions and the difference in drag level for the two airfoils was not accurately predicted. Author

N82-24176*# National Aeronautics and Space Administration, Washington, D. C.
CURRENT DEVELOPMENTS LIGHTER THAN AIR SYSTEMS
Norman J. Mayer 1981 15 p refs Presented at the United Nations Ind. Develop. Organ. Conf., Vienna, 19-22 Oct. 1981
(NASA-TM-84744; NAS 1.15:84744) Avail: NTIS HC A02/MF A01 CSCL 01A

Lighter than air aircraft (LTA) developments and research in the United States and other countries are reviewed. The emphasis in the U.S. is on VTOL airships capable of heavy lift, and on long endurance types for coastal maritime patrol. Design concepts include hybrids which combine heavier than air and LTA components and characteristics. Research programs are concentrated on aerodynamics, flight dynamics, and control of hybrid types. Author

N82-24177# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Aerospace and Ocean Engineering.
COMPUTATION OF HYPERSONIC LAMINAR VISCOUS FLOW OVER A BODY WITH MASS TRANSFER AND/OR SPIN AT ANGLE OF ATTACK
M. D. Kim and C. H. Lewis 14 May 1981 50 p refs
(AD-A111791) Avail: NTIS HC A03/MF A01 CSCL 20/4

Computational results of hypersonic laminar viscous flow over blunt-nosed bodies with mass transfer and/or spin are presented. An implicit-iterative numerical scheme at each marching step is used to solve the parabolized Navier-Stokes equations. The code takes into account the mass-transfer and spin effects in the boundary condition at the body surface and the periodic effect in the boundary condition around the body to facilitate convergence, the v-momentum equation has been used rather than the continuity equation to provide the pressure at the body boundary. The coupling effects of mass transfer and spin on the integrated forces and moments as well as the surface properties are presented and discussed. Author (GRA)

N82-24178# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Aerospace and Ocean Engineering.
PARABOLIZED NAVIER-STOKES PREDICTIONS FOR THREE-DIMENSIONAL VISCOUS SUPERSONIC FLOWS
S. Swaminathan, M. D. Kim, R. A. Thompson, and C. H. Lewis 14 May 1981 31 p refs
(AD-A111787) Avail: NTIS HC A03/MF A01 CSCL 20/4

A parabolized Navier-Stokes Code (HYTAC) is used to predict the supersonic, laminar or turbulent viscous flow about arbitrary geometries at moderate angles of attack, and the results are compared with those from other viscous and inviscid codes. The test cases presented in this paper include the external flow over a supersonic, blunt nosed inlet, a slab delta wing and an elliptic body at various Mach numbers. The results for the inlet are compared with the results from a viscous shock-layer code (VSL3D) and they show good agreement. The slab delta wing surface pressure compares well with the results from an inviscid code (STEIN) and with experimental results. The surface heat transfer for this case is in good agreement with the results from a boundary layer code using a streamline tracing (TRACE) and with experimental results. Author (GRA)

N82-24179# Delaware Univ., Newark. Dept. of Mechanical and Aerospace Engineering.
TRANSONIC PRESSURE DISTRIBUTION AND BOUNDARY LAYER CHARACTERISTICS OF A PROJECTILE WITH AN ASYMMETRIC AFTERBODY Final Report, Feb. 1978 - Jun. 1981
J. E. Danberg and R. H. Tschirschnitz Jun. 1981 75 p refs
(Grant DAAG29-78-G-0057)
(AD-A110844; TR-243; ARO-15172.4-E) Avail: NTIS HC A04/MF A01 CSCL 20/4

Measurements of pressure distribution and boundary layer characteristics were obtained on an asymmetric boattail projectile. Such configurations are being studied as potential alternatives to conventional boattails because of their reduced variation in moments in the transonic speed range. Wind tunnel tests were performed in the NASA Langley Research Center 8' Transonic Pressure Tunnel on a 5.8 caliber model with a triangular, conical and cylindrical afterbody. Integration of the pressure distribution data showed that the contribution of the triangular afterbody to the total drag is fifty percent of that of a conical configuration. Base drag and forebody drag for the triangular afterbody are assumed the same as for the conical boattail if the base areas are the same in the two cases. Integration of the moments of the pressure distribution permit the evaluation of the pitching moment configuration of the different afterbodies. The moments due to the triangular afterbody contribute relatively little to the overall pitching moment as compared to the strongly destabilizing effect of the conical boattail and the stabilizing effect of a cylindrical afterbody. Because of the asymmetric configuration the moments created depend on the orientation of the afterbody. GRA

N82-24180# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
FINITE ELEMENT ANALYSIS OF SUBSONIC FLOW OVER A LIFTING THIN AIRFOIL M.S. Thesis
John Clifford Gay Dec. 1981 188 p refs
(AD-A111123; AFIT/GAE/AA/81D-11) Avail: NTIS HC A09/MF A01 CSCL 20/4

The finite element method was used to solve the flow field problem around a thin, lifting, flat plate airfoil. The governing equation solved is the Laplace equation, which is valid for inviscid, irrotational, incompressible flow. The finite element equations were derived through the method of weighted residuals with weighting functions selected by the Galerkin method. For the purposes of analysis, the infinite flow field was replaced by a finite domain. Neumann type boundary conditions were imposed on the airfoil surface. Dirichlet boundary conditions were specified as required by the problem formulation for uniqueness. Three types of solution methods were used for various treatments of the jump discontinuity required in the lifting problem. The first method was a superposition technique, which treated the potential along the upper and lower nodes of the branch cut as constant. The circulation was determined by applying the Kutta condition during the combination of the subproblems. The second method was an iterative technique where the circulation was varied until the Kutta condition was satisfied. DOE

N82-24181# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
EFFECT OF MODIFICATION OF THE TRAILING EDGE OF A SEPARATING WALL ON THE DOWNSTREAM MIXING OF PARALLEL FLOWING STREAMS M.S. Thesis

Daniel J. Gurecki Dec. 1981 76 p refs
(AD-A111124; AFIT/GAE/AA/81D-12) Avail: NTIS HC A05/MF A01 CSCL 20/4

The objective of this thesis is to study ways to enhance the mixing of two parallel streams of air by modifying the trailing edge of a separating wall. An apparatus was designed which achieved two-dimensional, good quality flow near the center of the test section passage, with freestream turbulence intensity of 2.2 percent. Measurements of the wake were made varying the velocity of one stream down to 37.5 percent of the other stream velocity, both in and upstream of the asymptotic region of the wake. A single element hot wire was used to measure velocity and RMS readings. The flat plate trailing edge was then slotted with five, eight millimeter slots and re-tested. The higher turbulence and wider wake of the flat plate indicate that the slotted plate wake does not achieve as good mixing as the flat plate wake. No velocity ratio of the two streams was found to maximize the wake growth for either configuration. Wake growth doubled when the slower velocity was 0.40 of the faster velocity.
Author (GRA)

N82-24182# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
AN EXPERIMENTAL INVESTIGATION OF THE FLOW FIELD OF AN EJECTOR WING DESIGN EMPLOYING A PHOTON CORRELATION LASER VELOCIMETER M.S. Thesis
Damon G. Stephens Dec. 1981 122 p refs
(AD-A111134; AFIT/GAE/AA/81D-30) Avail: NTIS HC A06/MF A01 CSCL 20/2

The flow field about a dual element airfoil model employing an ejector for aerodynamic blowing is investigated. Flow visualization is obtained by smoke tunnel testing. Mean velocities and turbulence intensities are determined at various flow field locations. All data is obtained through the use of a Laser Doppler Velocimeter (LDV) using a photon correlation processing scheme. Flow field properties are computed from the LDV generated autocorrelation function. The free stream velocity and Reynolds number based on model chord length are 8 m/sec and 325,000 respectively. Two ejector velocity ratios are investigated: (U) ejector/(U) free stream = 0. and 2. Flow visiualization photography is conducted at seven angles of attack: -5 deg, 0 deg, 5 deg, 10 deg, 15 deg, 20 deg, and 25 deg and LDV data is acquired at 0 deg and 15 deg angles of attack. The results are presented in the form of flow visualization photographs and profiles of mean velocities and turbulence intensities. Conclusions are drawn concerning the aerodynamic benefit of the ejector wing design for possible V/STOL applications. GRA

N82-24183# Societe Nationale Industrielle Aerospatiale, Toulouse (France). Direction Etudes.
ACCOUNTING FOR THICKNESS EFFECTS IN THE CALCULATION OF SUBCRITICAL UNSTEADY AERODYNAMIC FORCES: APPLICATION TO WING-FUSELAGE INTERACTIONS [PRISE EN COMPTE DES EFFETS D'EPAISSEUR DANS LE CALCUL DES FORCES AERODYNAMIQUES INSTATIONNAIRES SURCRITIQUES. APPLICATIONS AUX INTERACTIONS FUSELAGE/SURFACES PORTANTES]
R. Barreau, M. Verdier, and J. P. Robert 7 Jan. 1982 47 p refs In FRENCH Presented at AAAF Colloq., Poitiers, France, 18-20 Nov. 1981
(SNIAS-821-111-106) Avail: NTIS HC A03/MF A01

A calculation method that yields an aerodynamic influence coefficient matrix for infinitely thin wings in a subsonic harmonic flow was modified in order to take into account the presence of a fuselage. A solution was obtained by the doublet lattice method and the method of singularites. Results relate to the development of generalized active control which requires a meticulous and precise knowledge of local unsteady aerodynamic forces. The computer program seems to give coherent results, the presence of a fuselage notably affecting the first chords of the wing. However, the method has not been sufficiently validated by calculations of aeroelastic significance. Author (ESA)

N82-24184# National Aerospace Lab., Amsterdam (Netherlands). Scientific Services Div.
CRITICAL EVALUATION OF A FINITE ELEMENT METHOD FOR THE CALCULATION OF TRANSONIC FLOW BASED ON CONSTRAINED MINIMIZATION
W. Vaatstra, A. E. P. Veldman, and J. vanderVooren Sep. 1980 42 p refs
(NLR-TR-80050-U) Avail: NTIS HC A03/MF A01

A method based on the constrained minimization of a cost function is evaluated for a case in which the transonic small perturbation equation is used. The resulting minimization problem is discretized in finite element form and is solved using a conjugate gradient method. Expansion shocks are suppressed by adding a penalty to the cost function, or by the introduction of an artificial viscosity. Results for a nonlifting 10% thick parabolic arc airfoil show that the method is inferior to established methods because of its nonconservativeness and large operation count compared to other methods. Author (ESA)

N82-24185# National Aerospace Lab., Amsterdam (Netherlands). Flight Dynamics Div.
A METHOD FOR DETERMINING TWO DIMENSIONAL WALL INTERFERENCE ON AN AIRFOIL FROM MEASURED PRESSURE DISTRIBUTIONS NEAR THE WALLS AND ON THE MODEL
J. Smith Jan. 1981 57 p refs
(NLR-TR-81016-U) Avail: NTIS HC A04/MF A01

A measured boundary condition method in which the wall boundary condition is expressed in terms of the difference between the total measured horizontal perturbation velocity component and the hypothetical model induced one is presented. The boundary contour, C, consists of the horizontal lines, distinct from the inside of the test section walls, connected by two vertical legs, at upstream and downstream infinity. The boundary value problem is solved by a singularity distribution method. In order to ensure a unique solution, C = zero. There are always collocation points at X = zero and (x) = L, where X is the test section coordinate parallel to main flow direction, and L is the semilength of the central part of C. Tests with a supercritical airfoil throughout the entire Mach range show the method performs well, but can be improved by reducing uncertainties such as tunnel calibration and side wall effects. Author (ESA)

N82-25152# Georgia Inst. of Tech., Atlanta. Dept. of Aerospace Engineering.
MEASUREMENTS OF TURBULENT MIXING IN THE NEAR WAKE OF A CIRCULAR CYLINDER BY PHOTON CORRELATION LASER VELOCIMETRY
R. E. Walterick, G. D. Catalano (Louisiana State Univ., Baton Rouge), and H. E. Wright (Air Force Inst. of Technology) *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 2 May 1981 p 33-48 refs (For primary document see N82-25149 15-99)
Avail: NTIS HC $60.50/MF $60.50 CSCL 01A

03 AIR TRANSPORTATION AND SAFETY

Includes passenger and cargo air transport operations; and aircraft accidents.

For related information see also *16 Space Transportation* and *85 Urban Technology and Transportation.*

N82-24186*# Lockheed-California Co., Burbank.
TRANSPORT AIRCRAFT CRASH DYNAMICS Final Report, Jan. 1980 - Mar. 1982
Gil Wittlin, Max Gamon, and Dan Shycoff Atlantic City, N.J. FAA Mar. 1982 471 p refs
(Contract NAS1-16083)
(NASA-CR-165851; NAS 1.26:165851; FAA-CT-82-69) Avail: NTIS HC A20/MF A01 CSCL 01C

Transport airplane accident data is presented. Formulation of candidate crash scenarios, the identification of the involvement of structural systems and subsystems in transport airplane accidents, a review of existing design criteria and philosophy, and conclusions and recommendations for R&D are included. The accident is organized in relation to pertinent accident types including undershoot, overrun, ground collision, obstacle impact, stall, wheels up or retracted landing, swerve and gear collapse. Ground to ground and air to ground crash scenarios are presented. Current state of the art procedures are used in the analysis of a

current airplane configuration for selected accident conditions. Available structure and occupant modeling techniques are assessed with regard to transport airplane crash dynamics modeling requirements. Design criteria and full scale crash tests are evaluated with regard to transport airplane applicability. A integrated crash dynamics analysis and test program for transport airplanes is presented along with conclusions and recommendations based on the results of the overall study. An accident data base computer program is described. S.L.

N82-24187# Southern Methodist Univ., Dallas, Tex. Dept. of Operations Research.
AN ANALYSIS OF THE LOGAIR DISTRIBUTION SYSTEM USING OPTIMIZATION PRINCIPLES Final Scientific Report, 1 Oct. 1976 - 30 Sep. 1981
Jeff L. Kennington Nov. 1981 41 p refs
(Grant AF-AFOSR-3151-77; AF Proj. 2304)
(AD-A110492; AFOSR-82-0029TR) Avail: NTIS HC A03/MF A01 CSCL 15/5

The major objective of this research was to build mathematical programming models and specialized software to assist Air Force personnel at Wright-Patterson AFB in the design of the LOGAIR Distribution System. A description of the problem, the mathematical models developed, and the software developed are presented. The software has been documented and installed at Wright-Patterson and is currently being used by Air Force Logistics Command personnel. A secondary objective of the principal investigator was to address the issue of how one can automatically convert general linear programs into network models. The underlying mathematical results which can be used to develop either exact transformation algorithms or heuristic transformation algorithms are represented in Section III. This section concludes with a heuristic algorithm which, it is believed, holds the best hope for routinely converting linear programs into network programs or network programs with extra constraints. GRA

04 AIRCRAFT COMMUNICATIONS AND NAVIGATION

Includes digital and voice communication with aircraft; air navigation systems (satellite and ground based); and air traffic control.

For related information see also *17 Spacecraft Communications, Command, and Tracking* and *32 Communications*.

N82-24188# Auburn Univ., Ala. Dept. of Electrical Engineering.
MARINE AIR TRAFFIC CONTROL AND LANDING SYSTEM (MATCALS INVESTIGATION), VOLUME 1
E. R. Graf, C. L. Phillips, and S. A. Starks Sep. 1981 396 p refs Prepared for Georgia Inst. of Technology, Atlanta 2 Vol.
(Contracts N00039-80-C-0032; N66314-73-C-0565; N66314-74-C-1362; N66314-74-C-1634; N00228-75-C-2080; N00228-76-C-2069; N00228-78-C-2233)
(AD-A110862; GIT/EES-1-A-2550-Vol-1) Avail: NTIS HC A17/MF A01 CSCL 17/7

This report contains the results of the continuation of Marine Air Traffic Control and Landing System (MATCALS) investigations. The report is organized into three main sections, namely Part Two, Part Three, and Part Four. Part Two presents a method of estimating the centroid location of a target utilizing a scan return amplitude versus angle information. Part Three contains the results of an investigation into replacing the alpha-beta filter in the MATCAL digital controller with an observer, in order to reduce the effects of radar noise. Part Four presents the results of an investigation into replacing the same alpha-beta filter with a tri-state adaptive filter, in order to reduce the effects of radar noise. GRA

N82-24189# Auburn Univ., Ala. Dept. of Electrical Engineering.
MARINE AIR TRAFFIC CONTROL AND LANDING SYSTEM (MATCALS INVESTIGATION), VOLUME 2
E. R. Graf, C. L. Phillips, and S. A. Starks Sep. 1981 155 p refs Prepared for Georgia Inst. of Technology, Atlanta 2 Vol.
(AD-A110863; GIT/EES-1-A-2550-Vol-2) Avail: NTIS HC A08/MF A01 CSCL 17/7

Three observers, designed for a reduced order system that represents the lateral system of F4J aircraft in an automatic landing configuration, are discussed. The observers are to be used in the aircrafts' lateral control system to estimate its lateral position and lateral velocity. Results obtained from simulation studies indicate that an observer may be used to improve the system's response. M.D.K.

N82-24190# Naval Postgraduate School, Monterey, Calif.
APPLICATION OF THE GLOBAL POSITIONING SYSTEM TO NEARSHORE HYDROGRAPHIC SURVEYS M.S. Thesis
Virginia Elisabeth Newell and Donald Dane Winter Sep. 1981 245 p refs
(AD-A111511) Avail: NTIS HC A11/MF A01 CSCL 17/7

Translocation of the global positioning system has proved to be a highly accurate method of position determination for onshore and airborne navigation but it had not been previously evaluated for nearshore hydrographic surveys. The technique of translocation for hydrographic operations involves the simultaneous reception of signals from the GPS satellites by two independent receivers: one receiver onboard the survey vessel and one located at the known stationary position. A position correction is obtained at the stationary receiver, which is then applied to the shipboard receiver online or during postprocessing. An accuracy determination of translocated GPS was conducted. Two methods of positioning were used for comparison with GPS: a least squares solution of three lines of position observed from three wild T 2 theodolites; and a position determined from ARTEMIS, a range azimuth short range microwave positioning system. Translocated GPS accuracies of 10 meters were determined. S.L.

N82-24191# Defense Mapping Agency Hydrographic and Topographic Center, Washington, D.C.
THE LONARS: AIDED DOPPLER SOLUTION. A NEW METHOD FOR PRECISE POSITIONING AT SEA
Thomas Jerardi (APL) and Brett Merritt Feb. 1982 40 p refs Presented at the 3rd Intern. Symp. on Satellite Doppler Positioning, Las Cruces, N.M.
(AD-A110552) Avail: NTIS HC A03/MF A01 CSCL 17/7

LONARS is a precision position-fixing system based primarily on the use of LORAN-C Radio Navigation. This system is used to precisely position test platforms in a 2500 square mile ocean area off the Florida coast. To meet future stringent accuracy requirements, APL and DMA personnel undertook an at-sea calibration of LONARS during April 1980. The single pass Doppler solution using the Magnavox Geoceier and DMAHTC precise ephemeris was chosen as the calibration standard. The LONARS system was used to model ship's drift during each Doppler pass. Included in the paper is an analysis of significant error sources in the Doppler fix, the utility of shore-ship single pass translocation, and a summary of operational problems encountered during the at-sea calibration. The estimated accuracy of LONARS-Aided Doppler was found to be 10 meters one-sigma. Author (GRA)

N82-24192# Fondazione Ugo Bordoni, Rome (Italy).
ROUND TABLE DISCUSSION ON THE TRANSFER OF RESULTS FROM THE PROJECT 'AIDS TO NAVIGATION AND CONTROL OF AIR TRAFFIC' Final Report [TAVOLA ROTONDA SUL TRASFERIMENTO DEI RISULTATI DEL PROGETTO FINALIZZATO 'AIUTI ALLA NAVIGAZIONE E CONTROLLO DEL TRAFFICO AEREO']
Francesco Valdoni 1981 20 p In ITALIAN Presented at Rome, 27 Mar. 1981; sponsored by CNR
(FUB-20-ATC-1981) Avail: NTIS HC A02/MF A01

The transfer of results from a project was discussed. Their contributions are summarized. The main subjects include assistance to national planning of navigation aids and traffic control, consultancy to state agencies, propositions to present to the International Civil Aviation Organization, marketing of Italian products derived from project research, and research planning after the project. Author (ESA)

N82-24266# Joint Publications Research Service, Arlington, Va.
SATELLIES AND RADIONAVIGATION
I. Meshcheryakov, S. Silvestrov, and A. Tsepelev *In its* USSR Rept.: Space, No. 15 (JPRS-80424) 29 Mar. 1982 p 102-107 Transl. into ENGLISH from Aviats. Kosmonavt. (USSR), no. 11, Nov. 1981 p 40-41 (For primary document see N82-24253 15-12)
Avail: NTIS HC A07/MF A01

05 AIRCRAFT DESIGN, TESTING AND PERFORMANCE

Includes aircraft simulation technology.

For related information see also *18 Spacecraft Design, Testing and Performance* and *39 Structural Mechanics*.

N82-24193*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
TIRE TREAD TEMPERATURES DURING ANTISKID BRAKING AND CORNERING ON A DRY RUNWAY
John A. Tanner, Robert C. Dreher, Sandy M. Stubbs, and Eunice G. Smith May 1982 57 p refs
(NASA-TP-2009; L-15110; NAS 1.60:2009) Avail: NTIS HC 04/MF A01 CSCL 01C

Aircraft tire tread temperatures under transient conditions associated with antiskid braking and cornering operations were studied. Peak tread temperatures were shown to be much lower when the braking effort did not reach the incipient skid point than when the tire was forced into incipient skids. Braking operation at high yaw angles increased average tread temperatures. Tire energy dissipation associated with braking and cornering was far greater than that associated with wheel spin-up at touchdown. The maximum friction level developed by a worn tire is shown to be more sensitive to variations in tread temperature and ground speed than that developed by a new tire. Locked-wheel skids and braking and cornering operations at high yaw angle produced molten rubber deposits on the runway surface and tread temperatures high enough to cause the rubber to undergo changes in chemial composition. R.J.F.

N82-24194*# Textron Bell Helicopter, Fort Worth, Tex.
V/STOL TILT ROTOR RESEARCH AIRCRAFT. VOLUME 1: GENERAL INFORMATION, REVISION C
Mike Kimbell and Aaron Whitener 8 Aug. 1980 357 p refs 4 Vol.
(Contract NAS2-7800)
(NASA-CR-166347; NAS 1.26:166347; REPT-301-099-022C) Avail: NTIS HC A16/MF A01 CSCL 01C

The configuration, operation and maintenance requirements for the contractor-furnished portion of the XV-15 research instrumentation and data acquisition system are defined. Descriptions of systems operation, maintenance and checkout procedures, and cable designations are given. R.J.F.

N82-24195*# Textron Bell Helicopter, Fort Worth, Tex.
V/STOL TILT ROTOR RESEARCH AIRCRAFT. VOLUME 2: SHIP 1 INSTRUMENTATION
11 Aug. 1978 456 p refs Sponsored by NASA 4 Vol.
(NASA-CR-166348; NAS 1.26:166348) Avail: NTIS HC A20/MF A01 CSCL 01C

Information covering sensor cables, sensor installation, and sensor calibration for the XV-15 aircraft number 1 is included. For each junction box (J-box) designation there is a schematic of the J-box disconnect harness instrumentation worksheets which show sensor location, and calibration data sheets for each sensor associated with that J-box. An index of measurement item codes to J-box locations is given in a table. Cross references are given. R.J.F.

N82-24196*# Textron Bell Helicopter, Fort Worth, Tex.
V/STOL TILT ROTOR RESEARCH AIRCRAFT. VOLUME 3: SHIP 2 INSTRUMENTATION
11 Aug. 1978 579 p refs Sponsored by NASA 4 Vol.
(NASA-CR-166349; NAS 1.26:166349) Avail: NTIS HC A25/MF A01 CSCL 01C

Information covering sensor cables, sensor installation, and sensor calibration for the XV-15 aircraft number 2 is included. For each junction box (J-box) designation there is a schematic of the J-box disconnect harness, instrumentation worksheets which show sensor location, and calibration data sheets for each sensor associated with that J-box. An index of measurement data codes to J-box locations is given in a table. Cross references are given. R.J.F.

N82-24197*# Textron Bell Helicopter, Fort Worth, Tex.
V/STOL TILT ROTOR RESEARCH AIRCRAFT. VOLUME 4: CFE TECHNICAL DATA
1 Oct. 1980 319 p refs Sponsored by NASA
(NASA-CR-166350; NAS 1.26:166350) Avail: NTIS HC A14/MF A01 CSCL 01C

Manufacturer drawings and specifications for contractor furnished transducers and related equipment for the XV-15 aircraft research instrumentation and data acquisition system are given. R.J.F.

N82-24198# Texas A&M Univ., College Station. Dept. of Mechanical Engineering.
DEVELOPMENT OF EXPERIMENTALLY COMPATIBLE SUBSYSTEM METHODS FOR THE ANALYSIS OF AIRCRAFT STRUCTURES Final Report, 1 Apr. - 30 Sep. 1981
Sherif T. Noah Nov. 1981 50 p refs
(Grant AF-AFOSR-0141-81)
(AD-A111242; AFOSR-82-0050TR) Avail: NTIS HC A03/MF A01 CSCL 01/3

This study is directed toward the development of experimentally compatible synthesis techniques for the determination of the dynamic characteristics of structures from the characteristics of their components. Based on an assessment of existing methods, selected free-interface component mode methods are utilized for the development. A simple technique is developed by which the residual effects, of truncated substructures' modes, required in forming the synthesis can be directly determined from test data. The data is to be obtained by shaking each of the substructures at a single point. Depending on the type of substructures involved, the inclusion of these residual effects is shown to be very significant in drastically improving the predicted modal shapes and damping of their assembly. A method is also presented for extending the selected synthesis formulations to enable their application to non-proportionally damped substructures. The study summarized in this report clearly demonstrates the feasibility of developing general, experimentally compatible synthesis techniques. Recommendations are included for the generalization and further development of the techniques developed in this study. Author (GRA)

N82-24199# Kaman Aerospace Corp., Windsor, Conn.
EXPERIMENTAL VERIFICATION OF FORCE DETERMINATION AND GROUND FLYING ON A FULL-SCALE HELICOPTER Final Report, May 1977 - Dec. 1980
R. Jones, W. G. Fannelly, E. J. Nagy, and J. A. Fabunmi May 1981 164 p refs
(Contract DAAJ02-77-C-0027; DA Proj. 1L2-62209-AH-76)
(USAAVRADCOM-TR-81-D-11; R-1625) Avail: NTIS HC A08/MF A01

Force determination is a method of obtaining dynamic loads acting on a vehicle in flight. These loads were determined from measured fuselage responses obtained in flight and calibration matrices obtained in a shake test. These forces obtained were verified by ground flying in a hangar and duplicated the responses obtained in flight. Author

06 AIRCRAFT INSTRUMENTATION

Includes cockpit and cabin display devices; and flight instruments.

For related information see also *19 Spacecraft Instrumentation* and *35 Instrumentation and Photography*.

N82-24200# Naval Air Development Center, Warminster, Pa. Software and Computer Directorate.

MIL-STD-1553B PROTOCOL SPECIFICATION FOR P-3 MODERNIZATION
William Bermingham and Robert Wolfe Feb. 1982 84 p refs (AD-A111679; NADC-81089-50) Avail: NTIS HC A05/MF A01 CSCL 17/2

This report describes a protocol developed for the P-3C Modernization Program utilizing the MIL-STD-1553B Data Bus. The protocol described in this report is intended as a menu of tools to be utilized, as the interfacing requirements govern, by the I/O and applications programmers. The work formats specified are a layer below that of the application software except where specifically mentioned. This protocol is intended to satisfy all currently envisioned P-3C interfacing requirements which fall into the realm of the restrictions and capabilities imposed by MIL-STD-1553B. GRA

07 AIRCRAFT PROPULSION AND POWER

Includes prime propulsion systems and systems components, e.g., gas turbine engines and compressors; and on-board auxiliary power plants for aircraft.

For related information see also *20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N82-24201*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
A PIECEWISE LINEAR STATE VARIABLE TECHNIQUE FOR REAL TIME PROPULSION SYSTEM SIMULATION
James R. Mihaloew and Stephen P. Roth (Pratt and Whitney Aircraft Group, West Palm Beach, Fla.) 1982 16 p refs Presented at the 13th Ann. Pittsburgh Conf. on Modelling and Simulation, Pittsburgh, 22-23 Apr. 1982; sponsored by IEEE, ISA, SCS and SMCS
(NASA-TM-82851; E-1210; NAS 1.15:82851) Avail: NTIS HC A02/MF A01 CSCL 21E

The emphasis on increased aircraft and propulsion control system integration and piloted simulation has created a need for higher fidelity real time dynamic propulsion models. A real time propulsion system modeling technique which satisfies this need and which provides the capabilities needed to evaluate propulsion system performance and aircraft system interaction on manned flight simulators was developed and demonstrated using flight simulator facilities at NASA Ames. A piecewise linear state variable technique is used. This technique provides the system accuracy, stability and transient response required for integrated aircraft and propulsion control system studies. The real time dynamic model includes the detail and flexibility required for the evaluation of critical control parameters and propulsion component limits over a limited flight envelope. The model contains approximately 7.0 K bytes of in-line computational code and 14.7 K of block data. It has an 8.9 ms cycle time on a Xerox Sigma 9 computer. A Pegasus-Harrier propulsion system was used as a baseline for developing the mathematical modeling and simulation technique. A hydromechanical and water injection control system was also simulated. The model was programmed for interfacing with a Harrier aircraft simulation at NASA Ames. Descriptions of the real time methodology and model capabilities are presented. Author

N82-24202*# Garrett Turbine Engine Co., Phoenix, Ariz.
STUDY OF ADVANCED PROPULSION SYSTEMS FOR SMALL TRANSPORT AIRCRAFT TECHNOLOGY (STAT) PROGRAM Final Report
C. F. Baerst, R. W. Heldenbrand, and J. H. Rowse Mar. 1981 119 p refs
(Contract NAS3-21997)
(NASA-CR-165610; NAS 1.26:165610; Garrett-21-3911) Avail: NTIS HC A06/MF A01 CSCL 21E

Definitions of takeoff gross weight, performance, and direct operating cost for both a 30 and 50 passenger airplane were established. The results indicate that a potential direct operating cost benefit, resulting from advanced technologies, of approximately 20 percent would be achieved for the 1990 engines. Of the numerous design features that were evaluated, only maintenance-related items contributed to a significant decrease in direct operating cost. Recommendations are made to continue research and technology programs for advanced component and engine development. T.M.

N82-24203*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FUTURE PROPULSION OPPORTUNITIES FOR COMMUTER AIRPLANES
William C. Strack Washington 1982 24 p refs Presented at the Commuter Airlines Meeting, Savannah, 24-26 May 1982; sponsored by the Society of Automotive Engineers
(NASA-TM-82880; E-1256; NAS 1.15:82880) Avail: NTIS HC A02/MF A01 CSCL 21E

Commuter airplane propulsion opportunities are summarized. Consideration is given to advanced technology conventional turboprop engines, advanced propellers, and several unconventional alternatives: regenerative turboprops, rotaries, and diesels. Advanced versions of conventional turboprops (including propellers) offer 15-20 percent savings in fuel and 10-15 percent in DOC compared to the new crop of 1500-2000 SHP engines currently in development. Unconventional engines could boost the fuel savings to 30-40 percent. The conclusion is that several important opportunities exist and, therefore, powerplant technology need not plateau. Author

N82-24204# Solar Turbines International, San Diego, Calif.
EVALUATION OF CAST TITANIUM ALLOY COMPRESSOR COMPONENTS, VOLUME 1 Final Report, May 1976 - Aug. 1978
Alvin N. Hammer St. Louis, Mo. Army Aviation Research and Development Command Nov. 1981 84 p 2 Vol.
(Contract DAAG46-76-C-0042)
(AD-A111431; RDR-1827-18-Vol-1;
USAAVRADCOM-TR-80-F-10-VOL-1;
AMMRC-TR-81-56-VOL-1) Avail: NTIS HC A05/MF A01 CSCL 21/5

The objective of this program was to characterize the properties of cast titanium alloy compressor impellers to provide a background for design, processing, and qualification for service in the Solar T62T-40 Titan auxiliary power unit and similar small radial gas turbine engines. Four titanium alloy investment casting foundries participated in the production of straight vane test wheels, a low-cost representation of the compressor impellers. As-cast and hot isostatic pressed (HIPed) Ti-6Al-4V was seen to have less than half the high cycle fatigue strength (20 to 30 ksi versus 60 ksi) of equivalent sections from forged and machined impellers. A modified solution heat treatment and aging cycle was developed which restored the fatigue strength to approximately 50 ksi, and which provided adequate tensile strength and ductility. High cycle fatigue strength of weld repaired vanes was significantly lower than that of unwelded, however. Cast and machined wheels offer substantial cost savings over wheels conventionally machined from forgings. These savings may be as much as 50%, or about $900 per wheel.
Author (GRA)

N82-25154# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md.
INSTRUMENTATION FOR SUPERSONIC COMBUSTION RESEARCH
F. S. Billig, R. E. Lee, and P. J. Waltrup *In its* The 1981 JANNAF Propulsion Meeting, Vol. 2 May 1981 p 67-99 refs (For primary document see N82-25149 15-99)
(Contract N00024-78-C-5384)
Avail: NTIS HC $60.50/MF $60.50 CSCL 21/5

08 AIRCRAFT STABILITY AND CONTROL

Includes aircraft handling qualities; piloting; flight controls; and autopilots.

N82-24205* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

HYDRAULIC ACTUATOR MECHANISM TO CONTROL AIRCRAFT SPOILER MOVEMENTS THROUGH DUAL INPUT COMMANDS Patent

Stephen C. Irick, inventor (to NASA) Issued 9 Jun. 1981 5 p Filed 17 Aug. 1979 Supersedes N80-11065 (18 - 02, p 0148)
(NASA-Case-LAR-12412-1; US-Patent-4,272,046; US-Patent-Appl-SN-067595; US-Patent-Class-244-226; US-Patent-Class-244-78; US-Patent-Class-244,213; US-Patent-Class-74-480R; US-Patent-Class-74-479) Avail: US Patent and Trademark Office CSCL 01C

An aircraft flight spoiler control mechanism is described. The invention enables the conventional, primary spoiler control system to retain its operational characteristics while accommodating a secondary input controlled by a conventional computer system to supplement the settings made by the primary input. This is achieved by interposing springs between the primary input and the spoiler control unit. The springs are selected to have a stiffness intermediate to the greater force applied by the primary control linkage and the lesser resistance offered by the spoiler control unit. Thus, operation of the primary input causes the control unit to yield before the springs, yet, operation of the secondary input, acting directly on the control unit, causes the springs to yield and absorb adjustments before they are transmitted into the primary control system.

Official Gazette of the U.S. Patent and Trademark Office

N82-24206*# Minnesota Univ., Minneapolis. Inst. of Technology.

EIGENSPACE TECHNIQUES FOR ACTIVE FLUTTER SUPPRESSION Semiannual Progress Report, 1 Oct. 1981 31 Mar. 1982

W. L. Garrard 31 Mar. 1982 116 p refs
(Grant NAG1-217)
(NASA-CR-168931; NAS 1.26:168931) Avail: NTIS HC A06/MF A0 CSCL 01C

Mathematical models to be used in the control system design were developed. A computer program, which takes aerodynamic and structural data for the ARW-2 aircraft and converts these data into state space models suitable for use in modern control synthesis procedures, was developed. Reduced order models of inboard and outboard control surface actuator dynamics and a second order vertical wind gust model were developed. An analysis of the rigid body motion of the ARW-2 was conducted. The deletion of the aerodynamic lag states in the rigid body modes resulted in more accurate values for the eigenvalues associated with the plunge and pitch modes than were obtainable if the lag states were retained. Author

N82-24207*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

AN ADAPTIVE TRACKING OBSERVER FOR FAILURE-DETECTION SYSTEMS

M. Sidar Apr. 1982 30 p refs
(NASA-TM-84240; A-8901; NAS 1.15:84240) Avail: NTIS HC A03/MF A01 CSCL 14B

The design problem of adaptive observers applied to linear, constant and variable parameters, multi-input, multi-output systems, is considered. It is shown that, in order to keep the observer's (or Kalman filter) false-alarm rate (FAR) under a certain specified value, it is necessary to have an acceptable proper matching between the observer (or KF) model and the system parameters. An adaptive observer algorithm is introduced in order to maintain desired system-observer model matching, despite initial mismatching and/or system parameter variations. Only a properly designed adaptive observer is able to detect abrupt changes in the system (actuator, sensor failures, etc.) with adequate reliability and FAR. Conditions for convergence for the adaptive process were obtained, leading to a simple adaptive law (algorithm) with the possibility of an a priori choice of fixed adaptive gains. Simulation results show good tracking performance with small observer output errors and accurate and fast parameter identification, in both deterministic and stochastic cases. T.M.

N82-24208*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

PREDICTION OF AIRCRAFT HANDLING QUALITIES USING ANALYTICAL MODELS OF THE HUMAN PILOT

Ronald A. Hess Apr. 1982 11 p refs
(NASA-TM-84233; A-8884; NAS 1.15:84233) Avail: NTIS HC A02/MF A01 CSCL 01C

The optimal control model (OCM) of the human pilot is applied to the study of aircraft handling qualities. Attention is focused primarily on longitudinal tasks. The modeling technique differs from previous applications of the OCM in that considerable effort is expended in simplifying the pilot/vehicle analysis. After briefly reviewing the OCM, a technique for modeling the pilot controlling higher order systems is introduced. Following this, a simple criterion for determining the susceptibility of an aircraft to pilot induced oscillations is formulated. Finally, a model based metric for pilot rating prediction is discussed. The resulting modeling procedure provides a relatively simple, yet unified approach to the study of a variety of handling qualities problems. R.J.F.

N82-24209*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

APPLICATION OF MODAL CONTROL TO WING-FLUTTER SUPPRESSION

Aaron J. Ostroff and Samuel Pines (Analytical Mechanics Associates, Inc., Jericho, N.Y.) May 1982 73 p refs
(NASA-TP-1983; L-14976; NAS 1.60:1983) Avail: NTIS HC A04/MF A01 CSCL 01C

A discrete modal control design approach that is applied to a single control surface, unswept aircraft wing subject to bending torsion flutter is described. The modal approach is a mathematical method to decouple the equations of motion into isolated differential equations. In this paper, a pole-placement approach is then applied to determine stability gains in the discrete plane using only the two complex-conjugate flutter-mode equations. A fixed gain Kalman filter is used to estimate the model amplitudes using three measurements. Results are presented for a full-state estimator (36 states) and two reduced state estimators using two different closed-loop pole locations. The control law is designed for a dynamic pressure that is 50 percent greater than the uncontrolled-flutter dynamic pressure. With constant control-law gains, the closed-loop system remains stable over the dynamic-pressure range from flutter onset to approximately an 80-percent increase in pressure. M.D.K.

N82-24210# Royal Aircraft Establishment, Farnborough (England).

THE DETERMINATION OF CRITICAL FLUTTER CONDITIONS OF NONLINEAR SYSTEMS

D. L. Woodcock Mar. 1981 26 p refs
(RAE-TM-Struct-986; BR80499) Avail: NTIS HC A03/MF A01

Direct determination of limit cycles of the periodic motion of aeroelastic systems in transonic flow is discussed. A method of imposed disturbances, based on energy balance methods, is proposed. The Lagrange equation of motion is approximated by a nonlinear matrix differential equation into which a nondimensional time, omega t, is introduced. Omega is the frequency of the periodic motion. The frequency parameter based on omega, the airspeed, V, and a reference length is upsilon. The relationship between the amplitude of steady state oscillations and V, and whether these oscillations are stable, are determined. Any one of the unknowns, e.g., upsilon, can be used to find the others.
Author (ESA)

N82-24211# European Space Agency, Paris (France).

A METHOD FOR DETERMINING THE AEROELASTIC BEHAVIOR OF AIRCRAFT WITH ACTIVE CONTROL SYSTEMS Ph.D. Thesis - Tech. Univ. Carolo-Wilhelmina, West Germany

Raymond Freymann Feb. 1982 129 p refs Transl. into ENGLISH from "Ueber das aeroelastische Verhalten von Flugzeugen mit aktiven Servo-Kontrollsystemen", Rept. DFVLR-FB-81-05 DFVLR, Goettingen, West Germany, Feb. 1981 Original report in GERMAN previously announced as N82-10047
(ESA-TT-719; DFVLR-FB-81-05) Avail: NTIS HC A07/MF A01; original report in GERMAN available at DFVLR Cologne DM 26,30

An analytical method for performing dynamic calculations on servocontrolled aircraft, based on an extended formulation of the generalized aeroelastic equations, is presented. The additional parameters introduces in the extended equations of motion are determined experimentally in a ground vibration test performed on a real aircraft structure as well as with help from an experimental-analytical method for determining the transfer functions of the hydraulic actuators. The elaborated method is shown to be satisfactory by comparison of measured and calculated data resulting from investigations performed on a model wing structure with a rudder driven by a hydraulic actuator.
Author (ESA)

09 RESEARCH AND SUPPORT FACILITIES (AIR)

Includes airports, hangars and runways; aircraft repair and overhaul facilities; wind tunnels; shock tube facilities; and engine test blocks.

For related information see also *14 Ground Support Systems and Facilities (Space)*.

N82-24212* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
ENVIRONMENTAL FOG/RAIN VISUAL DISPLAY SYSTEM FOR AIRCRAFT SIMULATORS Patent
Wendell D. Chase, inventor (to NASA) Issued 2 Feb. 1982 28 p Filed 29 Jun. 1979 Supersedes N79-33220 (17 - 24, p 3180)
(NASA-Case-ARC-11158-1; US-Patent-4,313,726; US-Patent-Appl-SN-053566; US-Patent-Class-434-42; US-Patent-Class-434-43) Avail: US Patent and Trademark Office CSCL 14B

An environmental fog/rain visual display system for aircraft simulators is described. The electronic elements of the system include a real time digital computer, a caligraphic color display which simulates landing lights of selective intensity, and a color television camera for producing a moving color display of the airport runway as depicted on a model terrain board. The mechanical simulation elements of the system include an environmental chamber which can produce natural fog, nonhomogeneous fog, rain and fog combined, or rain only. A pilot looking through the aircraft wind screen will look through the fog and/or rain generated in the environmental chamber onto a viewing screen with the simulated color image of the airport runway thereon, and observe a very real simulation of actual conditions of a runway as it would appear through actual fog and/or rain.
Official Gazette of the U.S. Patent and Trademark Office

N82-24213*# National Aeronautics and Space Administration, Washington, D. C.
WIND TUNNELS OF THE INSTITUTE OF MECHANICS OF MOSCOW STATE UNIVERSITY
S. M. Gorlin, ed. and G. E. Khudyakov, ed. Apr. 1982 150 p refs Transl. into ENGLISH of "Aerodinamicheskiye Truby Institata Mekhaniki" Moscow, 1971 p 1-100 Transl. by Franklin Book Programs, Inc., Cairo, Egypt. Original doc. prep. by Inst. of Mechanics, Moscow State Univ.
(Contract NSF-C-724)
(NASA-TM-76909; NAS 1.15:76909; TT-78-58009) Avail: NTIS HC A07/MF A01 CSCL 14B

The construction and characteristics of subsonic wind tunnels are described. Methods are presented, on which are based the experimental works conducted on these installations. The data logs of the treatment of the results of experiments are also given.
Author

N82-24214*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
ADAPTIVE-WALL WIND-TUNNEL RESEARCH AT NASA-AMES RESEARCH CENTER
Edward T. Schairer and Joel P. Mendoza May 1982 16 p refs
(NASA-TM-84236; A-8893; NAS 1.15:84236) Avail: NTIS HC A02/MF A01 CSCL 14B

Adaptive wall wind tunnel research is summarized. Small scale two and three dimensional wind tunnel experiments and numerical experiments with a three dimensional adaptive wall simulator are included. A NACA 0012 airfoil was tested in a 25 by 13 cm slotted wall test section. Airflow through the test section walls was controlled by adjusting the pressures in segmented plenums. Interference free conditions were successfully attained in subsonic and transonic flows. For the three dimensional experiment, the 25 by 13 cm wind tunnel was modified to permit cross stream wall adjustments. The test model was a semispan wing mounted to one sidewall. Wall interference was substantially reduced at several angles of attack at Mach 0.60. A wing on wall configuration was also modeled in the numerical experiments. These flow simulations showed that free air conditions can be approximated by adjusting boundary conditions at only the floor and ceiling of the test section. No sidewall control was necessary. Typical results from these experiments are discussed.
Author

12 ASTRONAUTICS (GENERAL)

For extraterrestrial exploration see *91 Lunar and Planetary Exploration*.

N82-24215# Centre National d'Etudes Spatiales, Toulouse (France).
THE TECHNOLOGY OF SPACEBORNE SCIENTIFIC EXPERIMENTS [LA TECHNOLOGIE DES EXPERIENCES SCIENTIFIQUES SPATIALES]
1981 1111 p refs In FRENCH Proc. of CNES Cours de Technol. Spatiale 1981, Toulouse, 11-22 May 1981
(ISSN-0244-8041) Avail: NTIS HC A99/MF A01

The planning and execution of space projects was discussed. Topics covered the French scientific space program, environmental and other constraints on space missions, experiment development technology and data processing with relation to spaceborne experiments. For individual titles, see N82-24216 through N82-24252.

N82-24216# Centre National d'Etudes Spatiales, Toulouse (France).
HISTORY OF THE FRENCH SATELLITE SPACE PROGRAM [HISTORIQUE DU PROGRAMME SPATIALE SCIENTIFIQUE FRANCAIS]
J. C. Husson *In its* The Technol. of Spaceborne Sci. Expt. 1981 p 3-10 In FRENCH (For primary document see N82-24215 15-12)
Avail: NTIS HC A99/MF A01

The amplitude of the French space program and the variety of research that supports it are discussed. Three objectives stand out: (1) develop space research and technology; (2) develop spacecraft and related technology; and (3) participate on a global scale in research into the terrestrial environment, space observation, and exploration of the solar system. Given this perspective, results concerning astronomy, planetology, geophysics, geodesy, meteorology, and biology are reviewed. Future projects in space manufacturing are also mentioned.
Author (ESA)

N82-24217# Centre National d'Etudes Spatiales, Paris (France).
PROSPECTS AND IMPLEMENTATION OF THE FRENCH SCIENTIFIC SPACE PROGRAM [PERSPECTIVES ET MISE EN OEUVRE DU PROGRAMME SPATIALE SCIENTIFIQUE FRANCAIS]
M. M. Guionnet *In its* The Technol. of Spaceborne Sci. Expt. 1981 p 11-27 In FRENCH (For primary document see N82-24215 15-12)
Avail: NTIS HC A99/MF A01

Ways in which the French space program contributes to science are reviewed. Current programs are then outlined and project management methods are explained. Activities of ESA are described, including spaceborne experiments, remote sensing, balloon sounding and other research and development. The prospects of the French space program are for continuing European cooperation, collaboration with NASA, and involvement in the space programs of other countries. The selection and financing

of these programs are discussed, emphasizing the decision making processes. A schematic model of program implementation is offered. Author (ESA)

N82-24218# Centre National d'Etudes Spatiales, Toulouse (France).
SPACECRAFT TRAJECTORIES [LES TRAJECTOIRES DES VEHICULES SPATIAUX] **c13**
J. P. Carrou *In its* The Technol. of Spaceborne Sci. Expt. 1981 p 31-91 ref In FRENCH (For primary document see N82-24215 15-12)
Avail: NTIS HC A99/MF A01

Laws and general theorems regarding Keplerian motion are reviewed and applied to orbit calculation. Orbit perturbations such as osculatory orbital elements, Lagrange and Gauss equations, and Lagrange equations with only terrestrial deformation are taken into account. Orbit extrapolation as well as backward determination are covered. Geosynchronous, heliosynchronous, and the Ariane transfer orbits are discussed as examples. The equations of motion for a probe touring the solar system, are given along with solution methods. The notion of spheres of influence is introduced and the method of juxtaposed conics is presented. Conditions that prevail when leaving a planet are explained and an interplanetary transfer is studied. Approaching a planet is also treated and the swingby technique with gravitational assist is illustrated. Author (ESA)

N82-24219# Centre d'Etudes et de Recherches, Toulouse (France).
THE SPACE ENVIRONMENT AND ITS CONSTANTS [L'ENVIRONNEMENT SPATIAL ET SES CONTRAINTES] **c46**
J. Berry *In* CNES The Technol. of Spaceborne Sci. Expt. 1981 p 93-122 refs In FRENCH (For primary document see N82-24215 15-12)
Avail: NTIS HC A99/MF A01

Different environmental conditions encountered by spacecraft in Earth orbits as well as in interplanetary space are described and spacecraft protective measures are proposed. Of importance in the interplanetary medium are solar radiation, the interplanetary magnetic field, solar wind, protons from solar flares, cosmic rays, and meteoroids. In Earth orbit the magnetosphere is of principle concern, especially due to trapped particles. The determination of particle fluxes encountered by a satellite is explained, including adaptation of shielding to predicted dosage. Faults are reviewed in semiconductors and dielectrics, and the value of space environment simulation is mentioned. Serious mission degradation can be prevented only if satellite-environment interaction is considered early on in spacecraft design. Author (ESA)

N82-24220# Centre National d'Etudes Spatiales, Toulouse (France).
THE ENVIRONMENT OF EXPERIMENTS ON BOARD ORBITAL SPACECRAFT [L'ENVIRONNEMENT DES EXPERIENCES SUR LE VEHICULE EN ORBITE]
P. Mauroy *In its* The Technol. of Spaceborne Sci. Expt. 1981 p 123-159 In FRENCH (For primary document see N82-24215 15-12)
Avail: NTIS HC A99/MF A01

Spacecraft environments in Earth orbit are described in terms of thermal radiation and microgravity. The effects of these two phenomena on potential spaceborne experiments are then characterized. Solar and terrestrial radiation are considered. The thermal environment of a satellite is determined, using a qualitative model of the temperature of an object in space. Thermal control methods are depicted. Microgravity in orbit is then treated. Results show that residual accelerations due to gravity, encountered in spacecraft, are far from negligible. Besides particular problems related to the handling of liquids, the design of experiments must not assume zero gravity. The situation is also of interest with relation to physics and physiology. Author (ESA)

N82-24221# Centre National d'Etudes Spatiales, Toulouse (France).
SATELLITE STABILIZATION [STABILISATION DES SATELLITES] **c15**
P. Duchon and J. M. Guilbert *In its* The Technol. of Spaceborne Sci. Expts. 1981 p 161-213 In FRENCH (For primary document see N82-24215 15-12)
Avail: NTIS HC A99/MF A01

General categories of satellite missions are reviewed, after which the suitability of different attitude and orbit stabilization techniques is explained. Satellite applications include telecommunication, meteorology, and Earth observation. Satellites also serve as experiment platforms and space probes. Satellite perturbation is discussed and both passive and active remedies are evoked. The phases and functional modes of satellite orbital life are then considered. The satellite SPOT is taken as an example of an observation satellite in low altitude orbit along with the OTS satellites as examples of telecommunication satellites. Attitude control is defined theoretically. Only spin stabilization and three axis stabilization are treated. The Euler equations and kinetic equations describing the evolution in attitude of a rigid body in space are derived. The attitude measurement and command system of METEOSAT is evaluated. Author (ESA)

N82-24222# Centre National d'Etudes Spatiales, Toulouse (France).
OUTGASSING AND CONTAMINATION IN SPACE [DEGAZAGE ET CONTAMINATION DANS L'ESPACE] **c18**
J. Guillin *In its* The Technol. of Spaceborne Sci. Expt. 1981 p 215-223 refs In FRENCH (For primary document see N82-24215 15-12)
Avail: NTIS HC A99/MF A01

The extent, importance and complexity of contamination problems regarding spacecraft are evoked. Among sources of contamination there are outgassing of materials in vacuum; leaks from pressurized vessels, combustion products from motors and contamination on the ground. Test schemes for parameterizing these sources are explained, including transport phenomena. Experimental measurements are reported. The effects of these contaminants on satellite performance are discussed and methods for reducing contamination are proposed. A program package that calculates the flux of contaminants in a space environment is introduced. The special case of manned spacecraft is brought up, citing Spacelab. Author (ESA)

N82-24223# Centre National d'Etudes Spatiales, Toulouse (France).
THE LAUNCH DYNAMIC ENVIRONMENT [L'ENVIRONNEMENT DYNAMIQUE DE LANCEMENT] **c15**
J. F. Imbert *In its* The Technol. of Spaceborne Sci. Expts. 1981 p 225-247 refs In FRENCH (For primary document see N82-24215 15-12)
Avail: NTIS HC A99/MF A01

Different dynamic loads experienced by a payload during launch are discussed. These include: sinus, transient, vibroacoustic, and shock loads, mainly low frequency. These general categories are illustrated with data from flight L01 of the Ariane launch vehicle. How this information about a typical launch can be transformed into dimensional and flight qualification specifications for a satellite is shown, taking the high resolution visible sensor (SPOT satellite instrument) as an example. Experience gained in designing Spacelab payloads to withstand shuttle launch is also evaluated. Results highlight the need for extensive ground testing, especially as concerns the effects of vibroacoustic phenomena on large payloads. Author (ESA)

N82-24224# Centre National d'Etudes Spatiales, Toulouse (France).
THE UPPER ATMOSPHERE ENVIRONMENT AND BALLOONS [L'ENVIRONNEMENT HAUTE ATMOSPHERE ET LES BALLOONS] **c46**
M. Rougeron *In its* The Technol. of Spaceborne Sci. Expts. 1981 p 249-275 In FRENCH (For primary document see N82-24215 15-12)
Avail: NTIS HC A99/MF A01

The different kinds of scientific balloons used to sound the atmosphere are considered. The structure of the atmosphere is reviewed, including typical radiation fluxes. Given this perspective, various missions are identified and the corresponding balloons are described. Constraints on the instrument packages that can be flown by balloon are discussed. These relate to payload configuration, mechanical properties, thermal control, and problems of payload recovery. The effective use of balloons shows

this method to be a cost attractive means of studying the atmosphere. Author (ESA)

N82-24225# Centre National d'Etudes Spatiales, Toulouse (France).

MANNED SPACECRAFT AND ONBOARD EXPERIMENTS [LES VEHICULES HABITES ET LES EXPERIENCES EMBARQUEES] c14

P. Huguier *In its* The Technol. of Spaceborne Sci. Expt. 1981 p 277-314 In FRENCH (For primary document see N82-24215 15-12)

Avail: NTIS HC A99/MF A01

The Spacelab and Salyut 6 manned space laboratories are compared for versatility and scientific potential. The Spacelab program is closely linked with space shuttle development and as such is untested. On the other hand, Salyut is already operational. Characteristics of Spacelab are described, emphasizing its extensive experimental resources. The first Spacelab program is detailed and further planned missions are mentioned. The installation of experiments in the module is depicted. The Salyut space station is better suited for long duration spaceflight than experimentation. Experimental design is limited by the transportation capabilities of the commuting Soyuz or Progress vehicles. Salyut missions to date are summarized. The role of man in the two spacecraft is outlined, pointing out the advantages of manned in-flight experimentation. Author (ESA)

N82-24226# Centre National d'Etudes Spatiales, Toulouse (France).

STRUCTURES MAKING UP SPACEBORNE EXPERIMENTS [STRUCTURES DES EXPERIENCES SPATIALES] c19

J. N. Giraudbit *In its* The Technol. of Spaceborne Sci. Expts. 1981 p 317-348 In FRENCH (For primary document see N82-24215 15-12)

Avail: NTIS HC A99/MF A01

Problems in satellite payload structural design are studied, taking the SPOT HRV instrument as an example. The mechanical architecture of the instrument is reviewed and dimensional criteria are identified based on data for the dynamic environment of the Ariane launch vehicle. A finite element dimensional analysis is used. Choice of materials is dictated by the mechanical behavior of the optical elements of the HRV camera which require a high degree of dimensional stability. The thermostable carbon fiber structures are described and design problems linked to carbon fiber reinforced plastics are brought out. The influence of thermoelastic deformations on optical performance is modeled in order to interpret structural load tests. A flight model for space environment qualification is proposed. Author (ESA)

N82-24227# Centre National d'Etudes Spatiales, Toulouse (France).

THE TECHNOLOGY OF ELECTROMECHANICAL DEVICES AND PNEUMATIC CIRCUITS [TECHNOLOGIE DES ELECTROMECANISMES ET DES CIRCUITS PNEUMATIQUES] c37

J. Maquet, L. Petitjean, and R. Salome *In its* The Technol. of Spaceborne Sci. Expt. 1981 p 349-417 refs In FRENCH (For primary document see N82-24215 15-12)

Avail: NTIS HC A99/MF A01

Space environment qualification of electromechanical devices is discussed. The special design constraints imposed by orbital operation are enumerated. In particular, vibratory effects which cause mission degradation are considered. Equipment options are reviewed, including frictionless bearings, elastic components, wet lubrication in hermetically sealed casings, and dry lubrication. Devices that combine these options are described. Dry lubrication in ball bearing races and transmissions is attractive for its simplicity, although mechanical performance is reduced. Specialized electric motors are also discussed. Pneumatic equipment is mentioned as especially suited to space applications. Author (ESA)

N82-24228# Centre National d'Etudes Spatiales, Toulouse (France).

THERMAL CONTROL OF SPACEBORNE EXPERIMENTS [LE CONTROLE THERMIQUE DES EXPERIENCES SPATIALES] c34

A. Rolfo *In its* The Technol. of Spaceborne Sci. Expt. 1981 p 419-433 refs In FRENCH (For primary document see N82-24215 15-12)

Avail: NTIS HC A99/MF A01

Heat calculation methods and applied thermal control principles are presented. The specificity of thermal control problems in a space environment, especially the absence of atmosphere, is emphasized. Convection is of very minor importance. The roles of conduction and radiation are discussed. Radiation laws are given and radiative exchange equations are derived for the exchange between two gray bodies. As a dimensional exercise, convective and radiative exchange are compared. Thermal control equipment is reviewed with relation to thermo-optic coefficients. Cooling systems are also covered. A grating spectrometer is described as a typical thermal control problem. Cooling of the detectors and difficulties due to the solar flux are treated. Space environment simulation for thermal tests is depicted and data analysis is explained. Results show the delicate balance of thermal control system parameters. Author (ESA)

N82-24229# Centre National d'Etudes Spatiales, Toulouse (France).

ONBOARD PROCESSING: GENERALITIES AND AN EXAMPLE OF AN EXPERIMENT RUN BY MICROPROCESSOR (OVEN) [TRAITEMENT BORD: GENERALITES AT EXEMPLE D'EXPERIENCE GEREE PAR MICROPROCESSEUR (FOUR)]

D. Dassaud *In its* The Technol. of Spaceborne Sci. Expt. 1981 p 435-460 In FRENCH (For primary document see N82-24215 15-12)

Avail: NTIS HC A99/MF A01

Onboard data handling architectures are presented and the components are described. The SPOT satellite is cited as representative of a centralized architecture. The gradient heating facility on board Spacelab is depicted as run by a decentralized one. Available memory and microprocessor devices are listed and characterized. The Spacelab experiment is broken down into its various functions in order to illustrate onboard processing. The command data management system is detailed and the end to end data flow path is shown. The role of the electronics is highlighted, covering temperature data acquisition, telecommand and telemetry, and spacecraft safety. The power consumption and efficiency of the entire system are summarized. Author (ESA)

N82-24230# Centre National d'Etudes Spatiales, Toulouse (France).

SPACEBORNE COMPUTER PROGRAMS [LE LOGICIEL EMBARQUE] c61

J. Abadie *In its* The Technol. of Spaceborne Sci. Expt. 1981 p 461-481 refs In FRENCH (For primary document see N82-24215 15-12)

Avail: NTIS HC A99/MF A01

Computer programs, intended for onboard applications in spacecraft, are discussed. Programming languages are compared for versatility and efficiency. Machine oriented languages are the most effective, but Assembly offers greater clarity. Editing routines and evolved languages are also considered. Criteria, governing the choice of microprocessor, are formulated. Command and control of a system by an onboard program are specified. As onboard computers are often oriented to real time operation, sequencing problems, direct memory access, and decoding of incoming signals are dealt with. The different steps in writing a program are outlined. After reviewing the performance of earlier onboard programs, more rigid structuring and standardization of computer programming are called for. Author (ESA)

N82-24231# Centre National d'Etudes Spatiales, Toulouse (France).

ELECTROMAGNETIC COMPATIBILITY [COMPATIBILITE ELECTROMAGNETIQUE] c32

J.-P. Catani *In its* The Technol. of Spaceborne Sci. Expt. 1981 p 483-496 In FRENCH (For primary document see N82-24215 15-12)

Avail: NTIS HC A99/MF A01

The dangers of electromagnetic interference to the proper functioning of electronic equipment are considered and corrective methodology is suggested. Situations where electromag-

netic interference is a particular nuisance, e.g., magnetic metal detectors interfering with cardiac pacemakers, are identified. The characteristics of this interference are discussed. These include propagation modes, radiative coupling, and conductive coupling. A spectral representation of compatability is also treated. Electromagnetic interference can either be dealt with at the source of the perturbing signal or by adjusting the specifications of the affected equipment. The second method is recommended.

Author (ESA)

N82-24232# Centre National de la Recherche Scientifique, Marseilles (France). Lab. d'Astronomie Spatiale.

NEW OPTICAL SYSTEMS FOR TWO DIMENSIONAL OBSERVATION IN ASTRONOMY [NOUVEAUX SYSTEMES OPTIQUES POUR L'OBSERVATION BIDIMENSIONNELLE EN ASTRONOMIE] c89

M. P. Cruvellier *In* CNES The Technol. in Spaceborne Sci. Expt. 1981 p 523-537 refs In FRENCH (For primary document see N82-24215 15-12)

Avail: NTIS HC A99/MF A01

The use of orbiting telescopes for astronomical observations is discussed. The advantages of spaceborne observatories, above the atmosphere, are pointed out and the general characteristics of potential celestial targets are given. Problems include pointing and stabilizing the spacecraft, developing highly sensitive apparatus, and transmitting the image to Earth. Spaceborne observation instruments are listed. These are the satellite D2B, the S.C.A.P. balloon-borne telescope, the FOCA 1000 and TMA 1000 telescopes, the FAUST telescope, the space Schmidt telescope, and the U.F.T. experiment. The main optical characteristics of all these instruments are shown. Author (ESA)

N82-24233# Centre National de la Recherche Scientifique, Marseilles (France). Lab. d'Astronomie Spatiale.

PHOTOMETRIC DETECTORS [LES DETECTEURS PHOTOMETRIQUES] c19

T. Nguyen-Trong *In* CNES The Technol. of Spaceborne Sci. Expt. 1981 p 539-564 refs In FRENCH (For primary document see N82-24215 15-12)

Avail: NTIS HC A99/MF A01

Two classes of detector, used in astronomical experiments, are described. These are: (1) photomultipliers and electron multiplier tubes for spectrometers and (2) image dissectors and image intensifiers for cameras. The structure and functional principles of these devices are explained. For the multipliers, spectral response (quantum yield), dark current, electronic gain, and amplitude distribution are given. Utilization of the anodic signals is specified. Particular characteristics that distinguish image dissectors from photomultipliers are pointed out. Besides technical characteristics, use of image intensifier output signal is treated. The analog method and the photon counting method are summed up. Author (ESA)

N82-24234# Centre National d'Etudes Spatiales, Toulouse (France).

UTILIZATION AND MISSION OF OPTICAL INSTRUMENTS IN SPACE PROJECTS [UTILISATION ET MISSION DES INSTRUMENTS OPTIQUES DANS LES PROJETS SPATIAUX] c19

J. Charra (Lab. de Physique Stellaire et Planetaire, France) *In its* The Technol. of Spaceborne Sci. Expt. 1981 p 565-579 In FRENCH (For primary document see N82-24215 15-12)

Avail: NTIS HC A99/MF A01

Pratical problems associated with the use of spaceborne optical systems are reviewed. These include optical adjustments, calibration (on the ground or in flight), and aging. The wide variety in the configuration of spacecraft imposes an immediate constraint on experimental design. Four examples (the lunar camera; Kalos; Misig; IKS Vega) are offered. The different phases in instrument development are identified. Causes of mission degradation due to reduced optical performance are pointed out. Among these opacification of optical surfaces, oxidation, and deposits out of the satellite atmosphere are noteworthy.

Author (ESA)

N82-24235# Centre National d'Etudes Spatiales, Toulouse (France).

PRODUCT RELIABILITY CONTROL IN SPACE PROGRAMS [L'ASSURANCE PRODUIT DANS LES PROGRAMMES SPATIAUX] c38

R. Chauffriasse *In its* The Technol. of Spaceborne Sci. Expt. 1981 p 581-616 In FRENCH (For primary document see N82-24215 15-12)

Avail: NTIS HC A99/MF A01

Basic principles of applied reliability control methods are explained with reference to spaceborne systems and equipment. Only the space segment is studied, particularly satellites, interplanetary probes, and manned spacecraft. Product reliability control comprehends four main concepts: (1) a mathematical (probabilistic) model of instantaneous reliability; (2) aerospace safety; (3) system availability; and (4) quality control. Methods used during the development phase of a program are reviewed. Failure prediction theory is recalled and calculation of MTBF is shown. Different faults are classified and a graphic representation of their temporal evolution is presented. A modal analysis of fault impact on mission reliability follows. A safety analysis, citing Spacelab, is developed. The impact of design redundancy on system reliability is treated. Quality control philosophy is mentioned. The proper integration of all these methods in order to assure reliability at each program level is stressed.

Author (ESA)

N82-24236# Centre National d'Etudes Spatiales, Toulouse (France).

EVALUATION OF CCDS [EVALUATION DES CCD] c33

G. Rolland *In its* The Technol. of Spaceborne Sci. Expt. 1981 p 617-624 In FRENCH (For primary document see N82-24215 15-12)

Avail: NTIS HC A99/MF A01

Space qualification test philosophy for charged coupled devices (CCD) is outlined. Functional principles of simplified metal oxide semiconductor structures are reviewed. After determining the performance characteristics of a device, a limited number (10) of devices undergo a technological preevaluation. This includes burn-in, electrical measurements, thermal cycling, vibration and acceleration tests. If optoelectronic performance continues to meet design requirements, a larger number (100) of devices undergo space qualification. These series of mechanical and thermal tests, chosen in function of the component structure and its potential weaknesses, provide a precise measure of application limits. Author (ESA)

N82-24237# Centre National d'Etudes Spatiales, Toulouse (France).

ELECTRONIC COMPONENTS [LES COMPOSANTS ELECTRONIQUES] c33

F. Linder *In its* The Technol. of Spaceborne Sci. Expt. 1981 p 625-647 refs In FRENCH (For primary document see N82-24215 15-12)

Avail: NTIS HC A99/MF A01

Characterization and test methods, applied in order to assure the quality and reliability of spaceborne electronic components, are described. Laboratory procedure is reviewed with reference to the Ariane and SPOT projects. The choice of type and manufacturer of components is explained. The setting of quality standards is dealt with and procurement policy is stated. Design application rules are summarized and fault analysis is outlined. A list of preferred components is given. Space qualification and evaluation procedures are set forth. Semiconductor technology is reviewed and performance of the different families of devices is given. Author (ESA)

N82-24238# Centre National d'Etudes Spatiales, Toulouse (France).

EVALUATION OF THE QUALITY OF MICROWAVE COMPONENTS [L'EVALUATION DE LA QUALITE DES COMPOSANTS HYPERFREQUENCES] c38

M. A. Cuquel *In its* The Technol. of Spaceborne Sci. Expt. 1981 p 649-657 In FRENCH (For primary document see N82-24215 15-12)

Avail: NTIS HC A99/MF A01

Quality control philosophy when dealing with microwave equipment is explained. Two technologies are considered: silicon bipolar transistor, and gallium arsenie field effect transistor. The lift off and autoalignment methods of fabrication are outlined. Technological evaluation involves checking that fabrication

standards are met and that electronic equipment is testing. Procurement is discussed. As an example of technological evaluation, the development of an X band field effect transistor for a satellite TV project is cited. Author (ESA)

N82-24239# Centre National d'Etudes Spatiales, Toulouse (France).
ASSEMBLY TECHNOLOGY [LES TECHNOLOGIES D'ASSEMBLAGE] c33
F. Linder *In its* The Technol. of Spaceborne Sci. Expt. 1981 p 659-687 refs In FRENCH (For primary document see N82-24215 15-12)
Avail: NTIS HC A99/MF A01

Laboratory procedure governing the mounting of electronic components is specified with relation to space projects. The domain of application covers: assembly materials and accessories (fixtures, holders, wrapping, glues, varnishes, potting compounds) assembly elements (printed circuits, wire, cables, connectors) assembly techniques (soldering, crimping, wiring, stripping) and microelectronic techniques (thin film hybrid circuits, thick film). The choice of materials, elements, and technology is explained. Quality control during assembly is discussed. Assembly procedure flow charts concerning printed circuits are offered as examples. Space qualification of assemblies is illustrated and failure modes are studied. Author (ESA)

N82-24240# Observatoire de Meudon (France).
DEVELOPMENT OF AN EXPERIMENT BY THE PRIME CONTRACTING LABORATORY [DEVELOPPEMENT D'UNE EXPERIENCE EN MAITRISE D'OEUVRE TOTALE DE LABORATOIRE]
M. Rene and S. Knoll *In* CNES The Technol. of Spaceborne Sci. Expt. 1981 p 689-721 refs In FRENCH (For primary document see N82-24215 15-12)
Avail: NTIS HC A99/MF A01

The various development phases of a spaceborne experiment are considered. Scientific space research is situated with respect to other (military, commercial) space activities. Citing the ISPM program as an example, preliminary studies that lead up to the definition of an experiment are reviewed. Task and feasibility analyses follow. An engineering model results and the choice of appropriate technology is discussed. The identification model is then built which undergoes a rigorous test program. When the complete system is integrated and functional, flight models are fabricated which are subject to final adjustments. The smooth and harmonious interaction of all elements of a development program is stressed. Author (ESA)

N82-24241# Centre National de la Recherche Scientifique, Verrieres-le-Buisson (France). Service d'Aeronomie.
DEVELOPMENT OF EXPERIMENTS IN CONJUNCTION WITH INDUSTRY: INSTRUMENT FOR SOLAR SPECTROSCOPY ON BOARD SPACELAB [DEVELOPPEMENT D'EXPERIENCES AVEC DES INDUSTRIELS. INSTRUMENT DE MESURE DU SPECTRE SOLAIRE A BORD DE SPACELAB] c19
G. Thuillier *In* CNES The Technol. of Spaceborne Sci. Expt. 1981 p 723-735 In FRENCH (For primary document see N82-24215 15-12)
Avail: NTIS HC A99/MF A01

A Spacelab experiment that measures solar flux in the spectra 170 to 3200 nm was developed. Instrument design stresses high temporal stability. The monochromator, the detectors and the clock system are described. The development program is reviewed, including procurement decision criteria. Quality control procedures for the various subcontractors are summarized. Space qualification standards are given and system integration is outlined. Author (ESA)

N82-24242# Societe pour le Perfectionnement des Materiels et Equipements Aerospatiaux, Toulouse (France).
TEST EQUIPMENT [LES MOYENS D'ESSAIS] c35
M. D. Dabadie *In* CNES The Technol. of Spaceborne Sci. Expt. 1981 p 737-765 In FRENCH (For primary document see N82-24215 15-12)
Avail: NTIS HC A99/MF A01

Test facilities that are used in the development of spacecraft are presented. Different tests are described, including electromagnetic compatibility, vibration, and thermal vacuum tests. For each category of test, the essential parameters to be simulated, the test apparatus, and the measurement equipment are described. An electrodynamic vibration simulator for vibration, shock, and modal analyses is depicted. A space environment simulator is also shown and the principles of solar simulation are illustrated. Complete operation of the space simulator is outlined. Author (ESA)

N82-24243# Centre National d'Etudes Spatiales, Toulouse (France).
ORGANIZATION OF A DATA PROCESSING PROJECT [ORGANISATION D'UN PROJET INFORMATIQUE DE REALISATION DE TRAITEMENT DES DONNEES] c81
D. Hermelin *In its* The Technol. of Spaceborne Sci. Expt. 1981 p 769-799 refs In FRENCH (For primary document see N82-24215 15-12)
Avail: NTIS HC A99/MF A01

The importance of coordinating data processing with the development and execution of a spaceborne experiment is considered. The system must be coherent overall (experiment + platform + data collection network, localization, dating and processing). The productivity of a computer programming team is modeled. Two people do not produce twice as much as one. The computer program development team is discussed, relating to its hierarchy, its organization, and the responsibilities of the project manager. Management and quality control are treated. The various phases of the development project are defined. Author (ESA)

N82-24244# Centre de Recherches en Physique de l'Environnement, Issy-les-Moulineaux (France).
OPERATION OF AN ONBOARD EXPERIMENT: OPERATIONAL ORGANIZATION AND DATA PROCESSING FOR THE GEOS PROJECT [EXPLOITATION D'UNE EXPERIENCE EMBARQUEE ORGANISATION DES OPERATIONS ET DU TRAITEMENT DES DONNEES. EXEMPLE DU PROJET GEOS] c81
B. delaPorte *In* CNES The Technol. of Spaceborne Sci. Expt. 1981 p 801-829 In FRENCH (For primary document see N82-24215 15-12)
Avail: NTIS HC A99/MF A01

The operation of satellite-borne instruments, assuming a successful launch, and subsequent data collection and distribution are discussed. The functioning of the GEOS satellites, possibilities for immediate response to operational problems, and principles of data selection and information dissemination are treated. Satellite servocommand operations are summarized. The GEOS mission is recalled and the onboard experiments are listed. Constraints imposed by a geostationary orbit are dealt with and the general operational philosophy is stated. Startup of the experiments and ground support facilities is defined. Telecommand philosophy, real time processing, and project organization are reviewed. Author (ESA)

N82-24245# Centre National d'Etudes Spatiales, Toulouse (France).
SIMULATION AND APPLICATIONS AS PART OF THE ARGOS PROJECT [LES SIMULATIONS ET LEURS APPLICATIONS REALISEES DANS LE CADRE DU PROJET ARGOS] c15
H. Donat *In its* The Technol. of Spaceborne Sci. Expt. 1981 p 831-868 refs In FRENCH (For primary document see N82-24215 15-12)
Avail: NTIS HC A99/MF A01

As part of the ARGOS development project, different numerical simulations were performed. The computer programs are presented as block diagrams. These programs cover: simulation of ocean buoys, collecting and transmitting data to a TDR satellite; simulation of the onboard command and test system; and simulation of the onboard data processing equipment. The system and data link tests are described. A comprehensive data processing system test (PROBATION experiment) is also reviewed. Results show the high efficiency and readiness of the ARGOS data collecting and localization system. Author (ESA)

N82-24246# Centre National d'Etudes Spatiales, Toulouse (France).

SYSTEM ANALYSIS ON THE LEVEL OF DATA PROCESSING [ANALYSE DE SYSTEME AU NIVEAU DU TRAITEMENT DES DONNEES] **c66**

G. Raphanel *In its* The Technol. of Spaceborne Sci. Expt. 1981 p 869-885 In FRENCH (For primary document see N82-24215 15-12)

Avail: NTIS HC A99/MF A01

Different data processing techniques and related systems are reviewed. Operations specifications, regarding the ground satellite interface, are treated. These concern telemetry, remote command control, dating, orbital position estimation, and attitude determination. The adequacy of existing satellite ground support facilities to meet satellite command control and data processing requirements is considered. Real time operation of a spaceborne system as well as off-line data collection and processing are dealt with. Planning early on during spacecraft development as well as operations simulation are necessary for all ground satellite interactions, especially with regards to onboard instrument calibration after launch. Author (ESA)

N82-24247# Centre National d'Etudes Spatiales, Toulouse (France).

PROCESSING OF TELEMETRY [TRAITEMENT OF TELEMESURES] **c17**

J. C. Terrisson *In its* The Technol. of Spaceborne Sci. Expt. 1981 p 887-907 In FRENCH (For primary document see N82-24215 15-12)

Avail: NTIS HC A99/MF A01

Reception and processing of telemetered data from spacecraft are discussed. Signal and noise are considered, then the various techniques of telemetry are reviewed. These cover frequency modulation, pulse amplitude modulation, pulse code modulation, phase shift keying and frequency shift keying. Different means of recording incoming data are mentioned. Data transmission networks are described. The functions of a data processing center are outlined and the types of equipment used in data handling are listed. The computer programs that make up a data processing system are also summarized. Author (ESA)

N82-24248# Centre National d'Etudes Spatiales, Toulouse (France).

ARCHITECTURE AND TESTS OF A COMPUTER SYSTEM FOR REAL TIME CONTROL [ARCHITECTURE ET TESTS D'UN SYSTEME INFORMATIQUE DE CONTROLE TEMPS REEL] **c60**

M. B. Despringre *In its* The Technol. of Spaceborne Sci. Expt. 1981 p 909-923 In FRENCH (For primary document see N82-24215 15-12)

Avail: NTIS HC A99/MF A01

A satellite ground support system is specified in terms of mission imposed constraints on system architecture. Configuration of a system for reception, transmission, and acquisition of data in real time is given. Organization of the different elements in the system is treated. System integration, operational tests, and system utilization are described. Safety and maintenance of the system during the entire satellite lifetime are stressed.

Author (ESA)

N82-24249# Centre National d'Etudes Spatiales, Toulouse (France).

WORKING UP A PREPROCESSING SYSTEM [REALISATION D'UNE CHAINE DE PRETRAITEMENT] **c61**

Denis Monchy *In its* The Technol. of Spaceborne Sci. Expt. 1981 p 925-951 refs In FRENCH (For primary document see N82-24215 15-12)

Avail: NTIS HC A99/MF A01

Writing a computer program can be decomposed and the difficulties that arise with spaceborne systems are explained. Projects concerned are balloon-borne experiments, satellite-borne black box experiments, French scientific experiments, and applications satellites. Program definition and client specifications are considered. A typical functional analysis is presented and an architecture is proposed. Computer programming is described in stages, in relation to norms, and for purposes of simulation. Functional acceptance, integration, and system startup are covered. Problems, involving client relations, are also mentioned.

Author (ESA)

N82-24250# Centre National d'Etudes Spatiales, Toulouse (France).

ARCHITECTURE OF A PREPROCESSING SYSTEM: ARCAD 3 [ARCHITECTURE D'UNE CHAINE DE PRETRAITEMENT: EXEMPLE ARCAD 3] **c60**

M. J. Dupic *In its* The Technol. of Spaceborne Sci. Expt. 1981 p 953-970 In FRENCH (For primary document see N82-24215 15-12)

Avail: NTIS HC A99/MF A01

Data processing architecture, integrating a spaceborne experiment with ground support facilities, is presented for the ARCAD 3 joint Franco-Soviet project. Maximum normalization of computer programs, optimum use of data processing equipment, and effective exploitation of project data are stressed. The choice of programming language and file maintenance scheme is discussed. The data processors are listed, including specifications. Data handling options are reviewed. Systems integration is depicted in block diagrams and the compatability of a processing sequence with other sequences is shown. Author (ESA)

N82-24251# Observatoire de Meudon (France).

VALIDATION AND APPLICATION OF PREPROCESSING [VALIDATION ET MISE EN EXPLOITATION DU PRETRAITEMENT] **c61**

S. Hoang *In its* The Technol. of Spaceborne Sci. Expt. 1981 p 971-982 In FRENCH (For primary document see N82-24215 15-12)

Avail: NTIS HC A99/MF A01

The preprocessing and processing of spaceborne experiment data, particularly from satellites or space probes, are discussed. Preprocessing is intended to condition data, received directly by telemetry, into a form accessible to scientific analysis. Processing takes the raw (preprocessed) data and extracts scientific information. Following a block diagram of data processing general organization, verification of a preprocessing program is described for nominal, then dynamic operation. As an example, verification of the systematic data flow structure for the radio astronomy experiment on board ISEE 3 is treated. Author (ESA)

N82-24252# Centre National d'Etudes Spatiales, Toulouse (France).

THE DATA PROCESSING CAPABILITIES OF THE TOULOUSE SPACE CENTER (CST) [LES MOYENS INFORMATIQUES DU CST] **c60**

A. Dargent *In its* The Technol. of Spaceborne Sci. Expt. 1981 p 983-1004 In FRENCH (For primary document see N82-24215 15-12)

Avail: NTIS HC A99/MF A01

The equipment and services available through the data processing center are described. The role played by data processing in a space program is summarized. Tasks include calculations for mission definition and analysis, spacecraft development, launch, and spaceborne experiment data exploitation. The responsibilities of the data processing center to the user are covered and information dissemination is outlined. Data processing equipment at the center is listed and capabilities are specified. Details on the various user services are given. Author (ESA)

N82-24253# Joint Publications Research Service, Arlington, Va.

USSR REPORT: SPACE, NO. 15

29 Mar. 1982 138 p refs Transl. into ENGLISH from various Russian publications

(JPRS-80424) Avail: NTIS HC A07/MF A01

This serial report contains news items, abstracts and articles of scientific reports on all aspects of the Soviet space program. The reports include manned mission highlights, space sciences, interplanetary research, space biology and medicine, space engineering, applications (satellite geodesy, meteorology, communications, remote sensing) and space science policy and administration. For individual titles, see N82-24254 through N82-24266.

N82-24254# Joint Publications Research Service, Arlington, Va.

EVOLUTION OF 'SALYUT' ORBITAL STATIONS **c14**

K. P. Feoktistov and M. M. Markov *In its* USSR Rept.: Space, No. 15 (JPRS-80424) 29 Mar. 1982 p 1-11 Transl. into

ENGLISH from Zemlya Vselennaya (USSR), no. 5, Sep. - Oct. 1981 p 10-17 (For primary document see N82-24253 15-12)
Avail: NTIS HC A07/MF A01

Improvements in the building of the Salyut spacecraft and updating new systems are discussed. The first Salyut station functioned in orbit for about 6 months. The Salyut 6 has been in operation for more than 4 years. The crew of the Salyut flew for a total of 23 days, while the crew of Salyut-6 stayed in space for more than half a year. To do so, new systems and units had to be created. The station specifications and the facilities supporting a prolonged stay in space by man had to be improved. The number of research programs and number of experiments performed was increased significantly. E.A.K.

N82-24255# Joint Publications Research Service, Arlington, Va.

LT. GEN. AVN TITOV ON 'SALYUT-6' PROGRAMS

Avn G. Titov *In its* USSR Rept.: Space, No. 15 (JPRS-80424) 29 Mar. 1982 p 12-16 Transl. into ENGLISH from Aviats. Kosmonavt. (USSR), no. 8, Aug. 1981 p 40-41 (For primary document see N82-24253 15-12)
Avail: NTIS HC A07/MF A01

The program of manned long duration space flights was completed by Soviet cosmonauts on the orbital scientific research complex Salyut-6 - Soyuz, and flight with international crews participating in the Intercosmos program are reported. Soyuz's functions research, design are enumerated, and its meaning to future space flights is outlined. E.A.K.

N82-24256# Joint Publications Research Service, Arlington, Va.

HOLOGRAPHIC EXPERIMENTS IN SPACE c35

S. Gorevich *In its* USSR Rept.: Space, No. 15 (JPRS-80424) 29 Mar. 1982 p 17-19 Transl. into ENGLISH from Aviats. Kosmonavt. (USSR), no. 11, Nov. 1981 p 42-43 (For primary document see N82-24253 15-12)
Avail: NTIS HC A07/MF A01

Experiments conducted on board the Salyut-6 station to demonstrate the suitability and efficiency of the holographic method and television equipment are discussed. The holographic method is of great value to aerospace sciences. It can gather a large amount of information within a short time onboard an orbital station. The information content per exposure is increased and a three dimensional or phased information is obtained. The performance of a series of experiments by the station crew requires continuous participation and monitoring by specialists in a narrow scientific discipline and by technicians on Earth. The activities can be enhanced when television transmitted images are three dimensional. E.A.K.

N82-24257# Joint Publications Research Service, Arlington, Va.

OPERATIONS AT FLIGHT CONTROL CENTER c14

A. Militsin *In its* USSR Rept.: Space, No. 15 (JPRS-80424) 29 Mar. 1982 p 20-23 Transl. into ENGLISH from Aviats. Kosmonavt. (USSR), no. 12, Dec. 1981 p 40-41 (For primary document see N82-24253 15-12)
Avail: NTIS HC A07/MF A01

The preparations which preceeded the launch of a spacecraft are outlined. The launch is the culmination of one stage of operations and it marks the start of another. It starts with the design of the space vehicle which gives birth to a new flight control center which means that new means and control principles are required. The design, development and introduction form the basic subject of concern. The ballistics experts calculate trajectories, the controllers plan the flight program, the mathematicians derive the algorithms and write the programs, the communications people and computer specialists select new technical and computer equipment. Training for personnel and the equipment follows. Coordination, mutual understanding and decision making on an operational basis and under any conditions, are developed. Situations are modeled on special simulators or played out by leaders in comprehensive training sessions. The flight control center is the place that prepares the flight. E.A.K.

N82-24258# Joint Publications Research Service, Arlington, Va.

PSYCHOLOGICAL ASPECTS OF AEROSPACE ORIENTATION c53

Avn G. Beregovoy *In its* USSR Rept.: Space, No. 15 (JPRS-80424) 29 Mar. 1982 p 45-49 Transl. into ENGLISH from Aviats. Kosmonavt. (USSR), no. 10, Oct. 1981 p 34-35 (For primary document see N82-24253 15-12)
Avail: NTIS HC A07/MF A01

The practical experience of cosmonauts on the ground and analysis of their activities during space flight is discussed. It is evidenced that control accuracy and precision in decision making by spacecraft commanders, especially in nonprogrammed situations, depend to a great extent on their experience as a pilot. Piloting a space vehicle has features which are peculiar to it alone. Nonetheless, the differences between space flight and the flight of an aircraft in the atmosphere seem fundamental only at first glance. It is concluded that spacecraft flight and aircraft flight have quite a lot in common, primarily as related to spatial orientation in the atmosphere and in space. E.A.K.

N82-24259# Joint Publications Research Service, Arlington, Va.

DOCKING METHODS FOR SPACECRAFT IN ORBIT c18

V. Syromyatnikov *In its* USSR Rept.: Space, No. 15 (JPRS-80424) 29 Mar. 1982 p 50-58 Transl. into ENGLISH from Aviats. Kosmonavt. (USSR), no. 5, May 1981 p 42-43 (For primary document see N82-24253 15-12)
Avail: NTIS HC A07/MF A01

The docking assemblies used for the Salyut-6 space station and the Soyuz spacecraft are discussed. The difference in the design of docking systems from those of other countries is examined. The outlook for the development of docking systems in outer space is investigated. E.A.K.

N82-24260# Joint Publications Research Service, Arlington, Va.

OPERATING PRINCIPLES OF OPTICO-ELECTRONIC INSTRUMENTS c74

V. Fedorov *In its* USSR Rept.: Space, No. 15 (JPRS-80424) 29 Mar. 1982 p 59-61 Transl. into ENGLISH from Aviats. Kosmonavt. (USSR), no. 11, Nov. 1981 p 22-23 (For primary document see N82-24253 15-12)
Avail: NTIS HC A07/MF A01

The term optico-electronic customarily refers to instruments in which processing of information on the subject under observation entails conversion of radiant energy to electrical energy. Such instruments are often components of sighting and navigation systems and are intended for detection and recognition of visible terrestrial features and for measurement of their coordinates during the day under normal weather conditions and when haze is present. Whether or not features with different colors and contrast levels can be detected and recognized depends on the observation conditions, the resolving power and sensitivity of the eye, and the properties of the optico-electronic instrument that governs its basic parameters. Atmospheric conditions have a considerable influence on the transmission of electromagnetic waves. In a clear atmosphere or in haze, short infrared waves (0.76 to 1.5 microns) in the 0.95 to 1.05 and 1.2 to 1.7 micron regions are transmitted better than waves falling into the visible region of the spectrum (0.4-0.76 microns). As a consequence, the distance from which objects can be detected with the aid of optico-electronic instruments operating in the region of short infrared wavelengths should be somewhat greater than that from which they can be discerned with the naked eye. S.L.

N82-24261# Joint Publications Research Service, Arlington, Va.

COOPERATIVE EFFORT URGED FOR DEVELOPMENT OF ORBITAL POWER STATIONS c14

R. Akhmetov *In its* USSR Rept.: Space, No. 15 (JPRS-80424) 29 Mar. 1982 p 62-65 Transl. into ENGLISH from Sots. Industr. (USSR), 22 Oct. 1981 p 4 (For primary document see N82-24253 15-12)
Avail: NTIS HC A07/MF A01

The concept of solar power stations is discussed in relation to construction, energy transmission, and support services. International interest and the benefits of international cooperation are considered. S.L.

N82-24262# Joint Publications Research Service, Arlington, Va.
DEVELOPMENT OF 'ISKRA' SATELLITES BY STUDENT DESIGN BUREAU **c15**
Sergey Mostinskiy *In its* USSR Rept.: Space, No. 15 (JPRS-80424) 29 Mar. 1982 p 66-72 Transl. into ENGLISH from Tekh.-Molodezhi (USSR), no. 6, Jun. 1980 p 5-7, 41 (For primary document see N82-24253 15-12)
Avail: NTIS HC A07/MF A01

A U.S.S.R. student project which has received broad recognition world wide is the communications AES 'Iskra 4A'. It was named 'Radio 2' after its entry into orbit, and received the international radio communications registration index RS. The project development is discussed. S.L.

N82-24263# Joint Publications Research Service, Arlington, Va.
COST-EFFECTIVENESS OF GEOGRAPHIC SURVEYING FROM SPACE **c43**
M. Ya. Lemeshev, Yu. V. Sukhotin, and A. F. Demidov *In its* USSR Rept.: Space, No. 15 (JPRS-80424) 29 Mar. 1982 p 76-96 refs Transl. into ENGLISH from Ekon. Mat. Metody (USSR), v. 17, no. 5, Sep. - Oct. 1981 p 920-935 (For primary document see N82-24253 15-12)
Avail: NTIS HC A07/MF A01

An economic evaluation of space based observation systems is presented. The cost effectiveness of these satellite systems is discussed. S.L.

N82-24264# Joint Publications Research Service, Arlington, Va.
PURPOSE, BACKGROUND OF 'INTERCOSMOS-21' MISSION
M. A. Rimsha *In its* USSR Rept.: Space, No. 15 (JPRS-80424) 29 Mar. 1982 p 94-98 Transl. into ENGLISH from Zemlya Vselennaya (USSR), no. 5, Sep. - Oct. 1981 p 39-41 (For primary document see N82-24253 15-12)
Avail: NTIS HC A07/MF A01

Research performed with satellites of the 'Intercosmos' series is discussed. Scientists have investigated short wave emissions of the Sun and the Earth's ionosphere and magnetosphere, cosmic rays and meteorite flows. Various technical systems were tested in these satellites. A transmitter of the 'beacon' type operated successfully in the first 'Intercosmos' satellites, while a special telemetric system later functioned in space and was recommended for further use. The unified telemetric system transmitted information directly to ground stations without the use of spacecraft instruments. S.L.

N82-24265# Joint Publications Research Service, Arlington, Va.
INTERSPUTNIK COMMUNICATIONS SYSTEMS **c32**
V. Romantsov *In its* USSR Rept.: Space, No. 15 (JPRS-80424) 29 Mar. 1982 p 99-101 Transl. into ENGLISH from Aviats. Kosmonavt. (USSR), no. 10, Oct. 1981 p 40-41 (For primary document see N82-24253 15-12)
Avail: NTIS HC A07/MF A01

The legal and technical bases for 'Intersputnik' were developed within the framework of cooperation among the socialist countries in the sphere of conquering and using outer space for peaceful purposes in the 'Intercosmos' program. Its activities are based on respect of sovereignty, noninterference in internal affairs, mutual assistance, and mutual benefit. 'Intercosmos' is an open intergovernmental organization in which any state may become a member that recognizes its aims and principles of activity, and undertakes the obligations which ensue from the agreement. Its ruling body is the Council, composed of one individual per number nation. The executive and administrative body is the Directorate. The 'Intersputnik' system of communications consists of a space complex and Earth stations. Under lease agreements, Soviet artificial Earth satellites of the 'Statsionar' type are used. They are located on a geocentric, circular orbit at points 14 degrees west longitude (Atlantic region) and 53 degrees east longitude (Indian region). The orbit lies in the plane of the equator at an altitude of about 36,000 km from the Earth's surface. S.L.

N82-24266# Joint Publications Research Service, Arlington, Va.
SATELLIES AND RADIONAVIGATION **c04**
I. Meshcheryakov, S. Silvestrov, and A. Tsepelev *In its* USSR Rept.: Space, No. 15 (JPRS-80424) 29 Mar. 1982 p 102-107 Transl. into ENGLISH from Aviats. Kosmonavt. (USSR), no. 11, Nov. 1981 p 40-41 (For primary document see N82-24253 15-12)
Avail: NTIS HC A07/MF A01

It is possible to substantially increase the efficiency of navigation services and give them the requisite properties with respect to global coverage, rapidity, and accuracy by creating space-based navigation systems in which artificial Earth satellites serve as reference points. It is best to employ the UHF range, in which it is possible to use devices that permit highly accurate determination of the distance, rate of change in distance, and direction to a satellite. Gathering of the requisite data rapidly is achieved by simultaneous observation of several satellites. The structure of a satellite radionavigation system is selected in such fashion that any number of aircraft and ships can simultaneously and independently determine their positions. S.L.

13 ASTRODYNAMICS

Includes powered and free-flight trajectories; and orbit and launching dynamics.

N82-24267# Royal Aircraft Establishment, Farnborough (England). Space Dept.
LIFETIME PREDICTION FOR SATELLITES IN LOW-INCLINATION TRANSFER ORBITS
D. G. King-Hele Oct. 1981 19 p refs
(RAE-TR-81119; RAE-Space-607; BR81708) Avail: NTIS HC A02/MF A01

An approximate analytical method was developed for predicting the lifetimes of objects, e.g. rockets used for satellite launches in transfer orbits with perigee height between 120 and 300 km, apogee height near 36,000 km, and inclination between 20 and 30 deg. There are four sources of error: (1) estimating the mass/area ratio of the satellite; (2) predicting the average solar activity during the lifetime; (3) errors in perigee height of the initial orbit used; and (4) errors in the estimated mean perigee height, caused by the approximations. Sources (1) and (2) give errors of 10% to 20% in lifetime. Sources (3) and (4) give errors of about 10 km in perigee height, equivalent to errors by a factor of two in lifetime for low perigee (130 km height) or 20% error for high perigee (250 km). Author (ESA)

N82-24268# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
ESTIMATION OF DECAYED SATELLITE REENTRY TRAJECTORIES Ph.D. Thesis
Raymond H. Barker, Jr. Dec. 1981 272 p refs
(AD-A111231; AFIT/DS/AA/81-3) Avail: NTIS HC A12/MF A01 CSCL 22/3

A technique was developed for estimation of decayed Earth satellite reentry trajectories to provide impact locations for debris search requirements. The technique used a linearized differential-corrector as an extension of existing orbit estimation methods. The reentry observations consisted of angular, infrared measurements from orbital sensors. An eight dimension state vector was used with components for position, velocity, a ballistic parameter, and the scale height from an isothermal density model. Simulated data runs identified the uncertain dynamics of the true reentry process as the most significant impact on estimator performance. The uncertain dynamics pose significant problems for standard model compensation methods such as adaptive pseudo-noise compensation or more sophisticated techniques such as statistical linearization or higher order filters. The adaptive determination of an 'ad hoc' scalar fading memory parameter was used to modify the estimator-computed state covariance matrix. The bias in the state estimates were well within the variance from this modified covariance matrix. GRA

N82-24269# Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.

SUMMARY OF ORBIT COMPUTATIONS FROM LASER RANGE OBSERVATIONS OF LAGEOS, STARLETTE, GEOS 3 AND SEASAT

K. F. Wakker and B. A. C. Ambrosius Jan. 1982 42 p refs Presented at ESOC Workshop on Orbit Determination for ERS-1 Altimeter Mission, Darmstadt, West Germany, 11-12 Jan. 1982 (VTH-LR-342) Avail: NTIS HC A03/MF A01

How the spatial, temporal and geographical distribution of laser range measurements, and the selection of satellite and perturbation force model, affect orbital and parameter solutions was investigated. Satellite perturbation due to the Earth gravity field, atmospheric drag, solar and lunar attraction, direct solar radiation pressure and solid Earth tides were considered. Dynamic model errors (not laser range measurement precision) limit the accuracy of a long arc orbital solution. Tailored gravity models are more accurate than GEM-9 or GEM-10B. For low-altitude satellites with large appendages, accurate orbit determination requires precise modeling of the time-dependent variation of the satellite cross sectional area. Density fluctuations due to short period solar and geomagnetic disturbances are modeled relatively poorly. Multiple drag coefficient models eliminate orbital effects of these model errors. Author (ESA)

N82-24270# Technische Hogeschool, Delft (Netherlands). Dept. of Aerospace Engineering.

PRELIMINARY ORBITAL ERROR ANALYSIS FOR ERS-1

K. F. Wakker and B. A. C. Ambrosius Jan. 1982 25 p refs Presented at ESOC Workshop on Orbit Determination for ERS-1 Altimeter Mission, Darmstadt, West Germany, 11-12 Jan. 1982 (VTH-LR-343) Avail: NTIS HC A02/MF A01

The accuracy with which the orbit of ERS-1 can be reconstituted from a short arc or a long arc of tracking data, and measurement and dynamic model error sources that contribute to orbital error, are discussed. For long arcs, the dominant error in the radial component is due to unknown gravitational forces. Solar radiation pressure also contributes. For arc lengths of more than one day, the error in the atmospheric drag perturbations becomes important. The addition of laser ranging data to the set of range rate data acquired at globally distributed Doppler tracking stations does not improve the radial orbital accuracy for arc lengths of one to three days. For arc lengths of 10 or 20 min, the major contributors to the radial orbital error are measurement, timing and station coordinate errors. Laser data improves short arc accuracy. If a radial rms error of 10 cm is required for short arcs, station positions must be known with an accuracy of five cm and the Doppler measurement noise should be < 0.2 cm/sec. Author (ESA)

N82-24218# Centre National d'Etudes Spatiales, Toulouse (France).

SPACECRAFT TRAJECTORIES [LES TRAJECTOIRES DES VEHICULES SPATIAUX]

J. P. Carrou *In its* The Technol. of Spaceborne Sci. Expt. 1981 p 31-91 ref In FRENCH (For primary document see N82-24215 15-12)
Avail: NTIS HC A99/MF A01

14 GROUND SUPPORT SYSTEMS AND FACILITIES (SPACE)

Includes launch complexes, research and production facilities; ground support equipment, mobile transporters; and simulators.

For related information see also *09 Research Support Facilities (Air)*.

N82-24271*# Boeing Aerospace Co., Seattle, Wash.

SPACE OPERATIONS CENTER SYSTEM ANALYSIS: REQUIREMENTS FOR A SPACE OPERATIONS CENTER, REVISION A Final Report, Aug. - Dec. 1981

G. R. Woodcock Jan. 1982 72 p
(Contract NAS9-16151)
(NASA-CR-160944; NAS 1.26:160944; D180-26495-2-Rev-A; Rept-2-1634-Rev-A) Avail: NTIS HC A04/MF A01 CSCL 14B

The system and program requirements for a space operations center as defined by systems analysis studies are presented as a guide for future study and systems definition. Topics covered include general requirements for safety, maintainability, and reliability, service and habitat modules, the health maintenance facility; logistics modules; the docking tunnel; and subsystem requirements (structures, electrical power, environmental control/life support; extravehicular activity; data management; communications and tracking; docking/berthing; flight control/propulsion; and crew support). Facilities for flight support, construction, satellite and mission servicing, and fluid storage are included as well as general purpose support equipment.
A.R.H.

N82-24225# Centre National d'Etudes Spatiales, Toulouse (France).

MANNED SPACECRAFT AND ONBOARD EXPERIMENTS [LES VEHICULES HABITES ET LES EXPERIENCES EMBARQUEES]

P. Huguier *In its* The Technol. of Spaceborne Sci. Expt. 1981 p 277-314 In FRENCH (For primary document see N82-24215 15-12)
Avail: NTIS HC A99/MF A01

N82-24254# Joint Publications Research Service, Arlington, Va.

EVOLUTION OF 'SALYUT' ORBITAL STATIONS

K. P. Feoktistov and M. M. Markov *In its* USSR Rept.: Space, No. 15 (JPRS-80424) 29 Mar. 1982 p 1-11 Transl. into ENGLISH from Zemlya Vselennaya (USSR), no. 5, Sep. - Oct. 1981 p 10-17 (For primary document see N82-24253 15-12)
Avail: NTIS HC A07/MF A01

N82-24257# Joint Publications Research Service, Arlington, Va.

OPERATIONS AT FLIGHT CONTROL CENTER

A. Militsin *In its* USSR Rept.: Space, No. 15 (JPRS-80424) 29 Mar. 1982 p 20-23 Transl. into ENGLISH from Aviats. Kosmonavt. (USSR), no. 12, Dec. 1981 p 40-41 (For primary document see N82-24253 15-12)
Avail: NTIS HC A07/MF A01

N82-24261# Joint Publications Research Service, Arlington, Va.

COOPERATIVE EFFORT URGED FOR DEVELOPMENT OF ORBITAL POWER STATIONS

R. Akhmetov *In its* USSR Rept.: Space, No. 15 (JPRS-80424) 29 Mar. 1982 p 62-65 Transl. into ENGLISH from Sots. Industr. (USSR), 22 Oct. 1981 p 4 (For primary document see N82-24253 15-12)
Avail: NTIS HC A07/MF A01

N82-25093*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

DESCRIPTION OF THE DEEP SPACE NETWORK

N. A. Renzetti *In its* The Telecommun. and Data Acquisition Rept. 15 Apr. 1982 p 1-2 (For primary document see N82-25092 15-99)
Avail: NTIS HC A09/MF A01 CSCL 14B

15 LAUNCH VEHICLES AND SPACE VEHICLES

Includes boosters; manned orbital laboratories; reusable vehicles; and space stations.

N82-24272* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

HIGH ACCELERATION CABLE DEPLOYMENT SYSTEM Patent

Thomas N. Canning, Christopher E. Barns, James P. Murphy, Bobby Gin, and Robert W. King, inventors (to NASA) Issued 9 Jun. 1981 6 p Filed 23 Apr. 1979 Supersedes N79-23432 (17 - 14, p 1857)
(NASA-Case-ARC-11256-1; US-Patent-4,271,761;

US-Patent-Appl-SN-032305; US-Patent-Class-102-504; US-Patent-Class-242-128) Avail: US Patent and Trademark Office CSCL 16D

A deployment system that will safely pay one cable from a ballistic forebody when the forebody is separated from an afterbody (to which the cable is secured and when the separation is marked by high acceleration and velocity) is described. N.W.

N82-24273 Institut d'Aeronomie Spatiale de Belgique, Brussels.
TABLE OF ARTIFICIAL SATELLITES, 1979 - 1980 [TABLEAU DES SATELLITES ARTIFICIELS, 1979 - 1980]
J. Vercheval 1981 42 p refs In FRENCH; ENGLISH summary
Supplement to Aeronomica-Acta-F-28-1979 Revision of Aeronomica-Acta-F-30-1980
(Aeronomica-Acta-A-32-1981;
Aeronomica-Acta-F-30-1980-Rev;
Aeronomica-Acta-F-28-1979-Sup) Avail: Issuing Activity

The weight of successful launchings up to Dec. 31, 1980 are summarized. Satellites launched in 1979 and 1980 are listed alphabetically, followed by a brief description of the missions for the satellites and the chronology of manned space flights. The table of satellites for 1957 to 1978 is corrected.
Author (ESA)

N82-24274# Aerospace Corp., El Segundo, Calif. Space Sciences Lab.
LABORATORY AND SPACE RESULTS FROM THE SSPM EXPERIMENT
P. F. Mizera, M. S. Leung, and H. K. A. Kan 15 Jul. 1981 47 p refs
(Contract F04701-80-C-0081)
(TOR-0081(6505-02)-3) Avail: NTIS HC A03/MF A01

Material charging results from the satellite surface potential monitor experiment were used as a framework for the modeling of spacecraft charging. Data from two magnetically disturbed times were chosen; one when the P78-2 satellite was in eclipse and the other which occurred prior to eclipse. On both days, the spacecraft charged negatively in the Earth's shadow to greater than 5 kV. Charging profiles of typical spacecraft materials received from the satellite surface potential monitor experiment aboard the P78-2 SCATHA Satellite show a number of interesting as well as unexpected features. During the natural charging event on April 24, 1979, the Kapton sample was charged to a voltage significantly lower than that of the Teflon sample whereas earlier test results showed they should be comparable. At the same time, also contrary to previous ground measurements, the quartz fabric sample acquired a surface potential up to several kilovolts instead of a few hundred volts normally observed in the laboratory. In order to resolve the difference observed between flight and ground measurements, a laboratory study was carried out. B.W.

N82-24275*# Boeing Aerospace Co., Seattle, Wash.
FUTURE ORBITAL TRANSFER VEHICLE TECHNOLOGY STUDY. VOLUME 2: TECHNICAL REPORT Final Report
Eldon E. Davis Washington NASA May 1982 255 p refs (Contract NAS1-16088)
(NASA-CR-3536; NAS 1.26:3536) Avail: NTIS HC A12/MF A01 CSCL 22B

Missions for future orbit transfer vehicles (1995-2010) are identified and the technology, operations and vehicle concepts that satisfy the transportation requirements are defined. Comparison of reusable space and ground based LO2/LH2 OTV's was made. Both vehicles used advanced space engines and aero assist capability. The SB OTV provided advantages in life cycle cost, performance and potential for improvement. Comparison of an all LO2/LH2 OTV fleet with a fleet of LO2/LH2 OTVs and electric OTV's was also made. The normal growth technology electric OTV used silicon cells with heavy shielding and argon ion thrusters. This provided a 23% advantage in total transportation cost. The impact of accelerated technology was considered in terms of improvements in performance and cost effectiveness. The accelerated technology electric vehicle used GaAs cells and annealing but did not result in the mixed fleet being any cheaper than an all LO2/LH2 OTV fleet. It is concluded that reusable LO2/LH2 OTV's can serve all general purpose cargo roles between LEO and GEO for the forseeable future. The most significant technology for the second generation vehicle would be space debris protection, on-orbit propellant storage and transfer and on-orbit maintenance capability. M.D.K.

N82-24276# Communications Research Centre, Ottawa (Ontario). Space Technology and Applications Branch.
THE ATTITUDE DYNAMICS OF HERMES AFTER TERMINATION OF THREE AXIS STABILIZATION
F. R. Vigneron and W. E. Krag (MIT) Feb. 1982 28 p refs Presented at the 12th Norad Spacecraft Identification Conf., 13-15 Aug. 1980
(CRC-1354) Avail: NTIS HC A03/MF A01

In late 1979, Hermes, an experimental geostationary communications satellite, experienced an Earth sensor malfunction which resulted in its loss of control and subsequent transition from 2 axis stabilization to spin about its maximum moment of inertia axis. During and after the transition, the Sun's reflections from the satellite were detected and monitored at the experimental test site (ETS) for the ground based electro-optical deep space surveillance system (GEODSS) in New Mexico. The satellite's attitude dynamics are deduced by correlating the GEODSS ETS observations with dynamics analysis and simulation. The transition to spin took about 15 days. Thereafter, the rate of spin decayed to zero in about 70 days due to solar pressure. The GEODSS ETS observations also provide data on the relative misalignment and bending of the two solar sails of the satellite. Author

N82-24277# Orbital Transport und Raketen A.G., Munich (West Germany).
DEVELOPMENT OF LAUNCH VEHICLES AS A CHALLENGE TO PRIVATE INDUSTRY [TRAEGER-RAKETENENTWICKLUNG ALS HERAUSFORDERUNG FUER DIE PRIVATINDUSTRIE]
Frank K. Wukasch 1981 16 p In GERMAN Presented at 30th Raumfahrtkongr. der Hermann-Oberth-Ges. e. V. Kurzzusammenfassung
Avail: NTIS HC A02/MF A01

The development philosophy of the Orbital Transport and Rockets Company (OTRAG), a private firm that develops cost optimized rockets for transportation of satellites and commercial payloads into space, is described. Payload capacity varies from 100 kg to 2 t. Materials and fabrication costs are reduced by using modules, standardization, extreme simplicity in every respect, and conventional materials and components. Three test flights were conducted from an area in Zaire, and a fourth one from an area in Libya. Author (ESA)

N82-24221# Centre National d'Etudes Spatiales, Toulouse (France).
SATELLITE STABILIZATION [STABILISATION DES SATELLITES]
P. Duchon and J. M. Guilbert *In its* The Technol. of Spaceborne Sci. Expts. 1981 p 161-213 In FRENCH (For primary document see N82-24215 15-12)
Avail: NTIS HC A99/MF A01

N82-24223# Centre National d'Etudes Spatiales, Toulouse (France).
THE LAUNCH DYNAMIC ENVIRONMENT [L'ENVIRONNEMENT DYNAMIQUE DE LANCEMENT]
J. F. Imbert *In its* The Technol. of Spaceborne Sci. Expts. 1981 p 225-247 refs In FRENCH (For primary document see N82-24215 15-12)
Avail: NTIS HC A99/MF A01

N82-24245# Centre National d'Etudes Spatiales, Toulouse (France).
SIMULATION AND APPLICATIONS AS PART OF THE ARGOS PROJECT [LES SIMULATIONS ET LEURS APPLICATIONS REALISEES DANS LE CADRE DU PROJET ARGOS]
H. Donat *In its* The Technol. of Spaceborne Sci. Expt. 1981 p 831-868 refs In FRENCH (For primary document see

N82-24215 15-12)
Avail: NTIS HC A99/MF A01

N82-24262# Joint Publications Research Service, Arlington, Va.
DEVELOPMENT OF 'ISKRA' SATELLITES BY STUDENT DESIGN BUREAU
Sergey Mostinskiy *In its* USSR Rept.: Space, No. 15 (JPRS-80424) 29 Mar. 1982 p 66-72 Transl. into ENGLISH from Tekh.-Molodezhi (USSR), no. 6, Jun. 1980 p 5-7, 41 (For primary document see N82-24253 15-12)
Avail: NTIS HC A07/MF A01

N82-24376# General Electric Co., Philadelphia, Pa. Space Systems div.
SYSTEM EFFECTIVENESS ACTIVITIES IN SUPPORT OF LONG LIFE COMMUNICATIONS SATELLITES
Paul Dick *In* ESA 2nd ESA Prod. Assurance Symp. Jan. 1982 p 95-104 (For primary document see N82-24362 15-31)
Avail: NTIS HC A11/MF A01; ESA, Paris FF 140 Member States, AU, CN and NO (+20% others)

N82-25126 Vought Corp., Dallas, Tex.
IMPULSIVE CONTROL FOR HYPERVELOCITY MISSILES
R. W. Magness *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 1 May 1981 p 235-252 ref (For primary document see N82-25112 15-99)
Copyright. Avail: NTIS HC $60.50/MF $60.50 CSCL 22/2

16 SPACE TRANSPORTATION

Includes passenger and cargo space transportation e.g., shuttle operations; and rescue techniques.

For related information see also *03 Air Transportation and Safety* and *85 Urban Technology and Transportation*.

N82-24278# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
NONLINEAR PARAMETER IDENTIFICATION: LIFT COEFFICIENT, DRAG COEFFICIENT BANK ANGLE HISTORIES FOR THE SPACE SHUTTLE TEST FLIGHT 1 M.S. Thesis
Harry Francis Johnson Dec. 1981 68 p refs
(AD-A111121; AFIT/GA/AA/81D-7) Avail: NTIS HC A04/MF A01 CSCL 20/4

A nonlinear, Square-Root Variable-Metric optimization technique is used to extract time histories for the lift coefficient, drag coefficient, and bank angle control variables from radar data of the Space Shuttle Test Flight. This optimization technique solves for these control variable histories by minimizing a weighted least squares performance index of the calculated versus experimental state equation time histories. The state model is a three degree of freedom representation of aircraft motion. Three intervals of data are evaluated. In each interval, polynomial functions represent the control variables, and the performance index is dependent only on the values of the polynomial coefficients. The larger of the first two intervals contained the shorter interval so that the effect of changing polynomial order and interval length could be explored. The third interval compared the calculated parameter histories with NASA's BET parameter histories with good correspondence. For all three intervals the calculated state histories closely matched the experimental state histories. These results show that given an appropriate state model, this optimization technique is useful for quickly obtaining good and inexpensive estimates of certain desired parameters. Author (GRA)

N82-25143* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SPACE SHUTTLE PROPULSION PERFORMANCE IMPROVEMENT OPTIONS
D. L. Blackwell *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 1 May 1981 p 515-526 ref (For primary document see N82-25112 15-99)
Copyright. Avail: NTIS HC $60.50/MF $60.50 CSCL 22B

17 SPACECRAFT COMMUNICATIONS, COMMAND AND TRACKING

Includes telemetry; space communications networks; astronavigation; and radio blackout.

For related information see also *04 Aircraft Communications and Navigation* and *32 Communications*.

N82-24279# National Aerospace Lab., Amsterdam (Netherlands). Informatica Hoofafdeling.
TELEMETRY CHANNEL CODING WITH THE (256,224) REED-SOLOMON CODE OVER GF (257) [TELEMETRIE-KANAALCODERING MET DE (256,224) REED-SOLOMON CODE OVER GF (257)]
M. R. Best and H. F. A. Roefs 1 May 1981 12 p refs In DUTCH; ENGLISH summary Presented at 2nd Symp. on Inform. Theory in the Benelux, Zoetermeer, Netherlands, 21-22 May 1981
(NLR-MP-81027-U) Avail: NTIS HC A02/MF A01

A concatenated coding scheme was developed for use in deep space missions. Telemetry signal transmission is improved by concatenation of a convolutional code and the (256,224) Reed-Solomon code over GF (257). Hardware implementation of the coding scheme is envisaged in 1985 for the Giotto mission to Halley's comet. Author (ESA)

N82-24247# Centre National d'Etudes Spatiales, Toulouse (France).
PROCESSING OF TELEMETRY [TRAITEMENT OF TELEMESURES]
J. C. Terrisson *In its* The Technol. of Spaceborne Sci. Expt. 1981 p 887-907 In FRENCH (For primary document see N82-24215 15-12)
Avail: NTIS HC A99/MF A01

N82-25096*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE EFFECTS OF VITERBI DECODER NODE SYNCHRONIZATION LOSSES ON THE TELEMETRY RECEIVING SYSTEM
L. J. Deutsch and R. L. Miller *In its* The Telecommun. and Data Acquisition Rept. 15 Apr. 1982 p 17-24 refs (For primary document see N82-25092 15-99)
Avail: NTIS HC A09/MF A01 CSCL 09F

N82-25108*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
MARK 4-A DSCC TELEMETRY SYSTEM DESCRIPTION
R. Burt *In its* The Telecommun. and Data Acquisition Rept. 15 Apr. 1982 p 130-138 refs (For primary document see N82-25092 15-99)
Avail: NTIS HC A09/MF A01 CSCL 06F

18 SPACECRAFT DESIGN, TESTING AND PERFORMANCE

Includes spacecraft thermal and environmental control; and attitude control.

For life support systems see *54 Man/System Technology and Life Support*. For related information see also *05 Aircraft Design, Testing and Performance* and *39 Structural Mechanics*.

N82-24280*# Old Dominion Univ., Norfolk, Va. Dept. of Mechanical Engineering and Mechanics.
CONTROL OF LARGE SPACE STRUCTURES AND ASSOCIATED PRECISION-POINTED PAYLOADS Annual Progress Report, 15 Feb. 1981 - 14 Feb. 1982
S. M. Joshi and G. L. Goglia May 1982 25 p refs
(Grant NAG1-102)
(NASA-CR-168920; NAS 1.26:168920) Avail: NTIS HC A02/MF A01 CSCL 22B

Stability and robustness of a two-level control system for large space structures were investigated. In particular, the effects of actuator/sensor nonlinearities and dynamics on the closed-loop stability were studied and the problem of control-systems design for fine-pointing of several individually pointed payloads mounted on a large space platform was examined. A composite controller is proposed and is stable and robust. T.M.

N82-24281*# General Software Corp., Landover, Md.
SPACECRAFT ATTITUDE CALIBRATION/VERIFICATION BASELINE STUDY
Lily C. Chen 28 Feb. 1981 64 p refs
(Contract NAS5-26205)
(NASA-CR-166799; NAS 1.26:166799) Avail: NTIS HC A04/MF A01 CSCL 22B

A baseline study for a generalized spacecraft attitude calibration/verification system is presented. It can be used to define software specifications for three major functions required by a mission: the pre-launch parameter observability and data collection strategy study; the in-flight sensor calibration; and the post-calibration attitude accuracy verification. Analytical considerations are given for both single-axis and three-axis spacecrafts. The three-axis attitudes considered include the inertial-pointing attitudes, the reference-pointing attitudes, and attitudes undergoing specific maneuvers. The attitude sensors and hardware considered include the Earth horizon sensors, the plane-field Sun sensors, the coarse and fine two-axis digital Sun sensors, the three-axis magnetometers, the fixed-head star trackers, and the inertial reference gyros. Author

N82-24282*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MOTION OF THE ANGULAR MOMENTUM VECTOR IN BODY COORDINATES FOR TORQUE-FREE DUAL-SPIN SPACECRAFT
Joseph V. Fedor Dec. 1981 26 p refs
(NASA-TM-83879; NAS 1.15:83879) Avail: NTIS HC A03/MF A01 CSCL 22B

The motion of the angular momentum vector in body coordinates for torque free, asymmetric dual spin spacecraft without and, for a special case, with energy dissipation on the main spacecraft is investigated. Without energy dissipation, two integrals can be obtained from the Euler equations of motion. Using the classical method of elimination of variable, the motion about the equilibrium points (six for the general case) are derived with these integrals. For small nutation angle, theta, the trajectories about the theta = 0 deg and theta = 180 deg points readily show the requirements for stable motion about these points. Also the conditions needed to eliminate stable motion about the theta = 180 deg point as well as the other undesireable equilibrium points follow directly from these equations. For the special case where the angular momentum vector moves about the principal axis which contains the momentum wheel, the notion of 'free variable' azimuth angle is used. Physically this angle must vary from 0 to 2 pi in a circular periodic fashion. Expressions are thus obtained for the nutation angle in terms of the free variable and other spacecraft parameters. Results show that in general there are two separate trajectory expressions that govern the motion of the angular momentum vector in body coordinates. S.L.

N82-24283# Engins Matra, Velizy (France).
STUDY OF DIGITAL ADAPTIVE ATTITUDE CONTROL TECHNIQUES FOR FLEXIBLE SPACECRAFT Final Report
B. Claudinon and B. Govin Paris ESA Jun. 1981 250 p refs
(Contract ESTEC-4120/79/NL-AK(SC))
(ESA-CR(P)-1519) Avail: NTIS HC A11/MF A01

Adaptive control techniques for application to flexible large space structures were investigated. Both idealized and realistic spacecraft, having complex configurations with poorly known or defined attitude dynamics characteristics, were modeled, using finite element methods (NASTRAN, STARDYNE). Digital adaptive active structural modal control of spacecraft, implemented with onboard processors, was studied. Digital aspects were considered for simulation, algorithm implementation, sampling rate selection, and transfer function discretization. Model reduction schemes were reviewed and one (modal gain truncation criterion) was retained. A typical satellite configuration was chosen and analyzed through the STARDYNE finite element analysis program. Modal data were then analyzed with the multivariable flexible systems analysis program, MFSAP, in order to obtain a reduced model and optimal gains for a linear quadratic regulator. Author (ESA)

N82-24222# Centre National d'Etudes Spatiales, Toulouse (France).
OUTGASSING AND CONTAMINATION IN SPACE [DEGAZAGE ET CONTAMINATION DANS L'ESPACE]
J. Guillin *In its* The Technol. of Spaceborne Sci. Expt. 1981 p 215-223 refs In FRENCH (For primary document see N82-24215 15-12)
Avail: NTIS HC A99/MF A01

N82-24259# Joint Publications Research Service, Arlington, Va.
DOCKING METHODS FOR SPACECRAFT IN ORBIT
V. Syromyatnikov *In its* USSR Rept.: Space, No. 15 (JPRS-80424) 29 Mar. 1982 p 50-58 Transl. into ENGLISH from Aviats. Kosmonavt. (USSR), no. 5, May 1981 p 42-43 (For primary document see N82-24253 15-12)
Avail: NTIS HC A07/MF A01

N82-25160# Martin Marietta Aerospace, Denver, Colo.
A MULTIMISSION TANK FOR NEXT GENERATION SPACECRAFT
D. A. Fester and R. N. Eberhardt *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 2 May 1981 p 191-214 refs (For primary document see N82-25149 15-99)
Copyright. Avail: NTIS HC $60.50/MF $60.50 CSCL 22/2

19 SPACECRAFT INSTRUMENTATION

For related information see also *06 Aircraft Instrumentation* and *35 Instrumentation and Photography*.

N82-24284*# Texas Univ. at Dallas, Richardson.
PIONEER VENUS LARGE PROBE NEUTRAL MASS SPECTROMETER Final Report
John Hoffman 24 May 1982 83 p refs
(Grant NAGw-64)
(NASA-CR-168963; NAS 1.26:168963) Avail: NTIS HC A05/MF A01 CSCL 14B

The deuterium hydrogen abundance ratio in the Venus atmosphere was measured while the inlets to the Pioneer Venus large probe mass spectrometer were coated with sulfuric acid from Venus' clouds. The ratio is (1.6 + or - 0.2) x 10 to the minus two power. It was found that the 100 fold enrichment of deuterium means that Venus outgassed at least 0.3% of a terrestrial ocean and possibly more. E.A.K.

N82-24226# Centre National d'Etudes Spatiales, Toulouse (France).
STRUCTURES MAKING UP SPACEBORNE EXPERIMENTS [STRUCTURES DES EXPERIENCES SPATIALES]
J. N. Giraudbit *In its* The Technol. of Spaceborne Sci. Expts. 1981 p 317-348 In FRENCH (For primary document see N82-24215 15-12)
Avail: NTIS HC A99/MF A01

N82-24233# Centre National de la Recherche Scientifique, Marseilles (France). Lab. d'Astronomie Spatiale.
PHOTOMETRIC DETECTORS [LES DETECTEURS PHOTOMETRIQUES]
T. Nguyen-Trong *In* CNES The Technol. of Spaceborne Sci. Expt. 1981 p 539-564 refs In FRENCH (For primary document see N82-24215 15-12)
Avail: NTIS HC A99/MF A01

N82-24234# Centre National d'Etudes Spatiales, Toulouse (France).
UTILIZATION AND MISSION OF OPTICAL INSTRUMENTS

IN SPACE PROJECTS [UTILISATION ET MISSION DES INSTRUMENTS OPTIQUES DANS LES PROJETS SPATIAUX]
J. Charra (Lab. de Physique Stellaire et Planetaire, France) *In its* The Technol. of Spaceborne Sci. Expt. 1981 p 565-579 In FRENCH (For primary document see N82-24215 15-12)
Avail: NTIS HC A99/MF A01

N82-24241# Centre National de la Recherche Scientifique, Verrieres-le-Buisson (France). Service d'Aeronomie.
DEVELOPMENT OF EXPERIMENTS IN CONJUNCTION WITH INDUSTRY: INSTRUMENT FOR SOLAR SPECTROSCOPY ON BOARD SPACELAB [DEVELOPPEMENT D'EXPERIENCES AVEC DES INDUSTRIELS. INSTRUMENT DE MESURE DU SPECTRE SOLAIRE A BORD DE SPACELAB]
G. Thuillier *In* CNES The Technol. of Spaceborne Sci. Expt. 1981 p 723-735 In FRENCH (For primary document see N82-24215 15-12)
Avail: NTIS HC A99/MF A01

20 SPACECRAFT PROPULSION AND POWER

Includes main propulsion systems and components e.g., rocket engines; and spacecraft auxiliary power sources.

For related information see also *07 Aircraft Propulsion, 28 Propellants and Fuels,* and *44 Energy Production and Conversion.*

N82-24285*# Colorado State Univ., Fort Collins. Dept. of Mechanical Engineering.
ELECTRIC THRUSTER RESEARCH
Harold R. Kaufman and Raymond S. Robinson Dec. 1981 151 p refs
(Grant NsG-3011)
(NASA-CR-165603; NAS 1.26:165603) Avail: NTIS HC A08/MF A01 CSCL 21C

The multipole discharge chamber of an electrostatic ion thruster is discussed. No reductions in discharge losses were obtained, despite repeated demonstration of anode potentials more positive than the bulk of the discharge plasma. The penalty associated with biased anode operation was reduced as the magnetic integral above the biased anodes was increased. The hollow cathode is discussed. The experimental configuration of the Hall current thruster had a uniform field throughout the ion generation and acceleration regions. To obtain reliable ion generation, it was necessary to reduce the magnetic field strength, to the point where excessive electron backflow was required to establish ion acceleration. The theoretical study of ion acceleration with closed electron drift paths resulted in two classes of solutions. One class has the continuous potential variation in the acceleration region that is normally associated with a Hall current accelerator. The other class has an almost discontinuous potential step near the anode end of the acceleration region. This step includes a significant fraction of the total acceleration potential difference. Author

N82-24286*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
AN INSIGHT INTO AUXILIARY PROPULSION REQUIREMENTS OF LARGE SPACE SYSTEMS
James E. Maloy and William W. Smith (Boeing Aerospace Co., Seattle) 1982 21 p refs To be presented at the 18th Joint Propulsion Conf., Cleveland, 21-23 Jun. 1981
(NASA-TM-82827; E-1185; NAS 1.15:82827) Avail: NTIS HC A02/MF A01 CSCL 21H

Electric and chemical propulsion systems' requirements for Large Space Systems (LSS) launchable by a single Shuttle are considered. Sets of generic LSS classes (ranging in size from 30 m to 250 m) are described and the disturbance force and torque requirements for low Earth orbit (LEO), geosynchronous Earth orbit (GEO), and LEO-GEO transfer, are given. Auxiliary propulsion requirements were determined as a function of: specific impulse (250 and 500 sec. for chemical and 1000, 3000, and 10000 sec. for electric); orbit; and angle of orientation. The results were used to size the Auxiliary Propulsion System (thruster size, fuel requirements, power processor, etc). T.M.

N82-24287*# General Dynamics/Convair, San Diego, Calif.
LOW-THRUST CHEMICAL PROPULSION SYSTEM PROPELLANT EXPULSION AND THERMAL CONDITIONING STUDY. EXECUTIVE SUMMARY
F. Merino, I. Wakabayashi, R. L. Pleasant, and M. Hill Apr. 1982 42 p refs
(Contract NAS3-22650)
(NASA-CR-165622; GDC-NAS-82-001; NAS 1.26:165622)
Avail: NTIS HC A03/MF A01 CSCL 21H

Preferred techniques for providing abort pressurization and engine feed system net positive suction pressure (NPSP) for low thrust chemical propulsion systems (LTPS) were determined. A representative LTPS vehicle configuration is presented. Analysis tasks include: propellant heating analysis; pressurant requirements for abort propellant dump; and comparative analysis of pressurization techniques and thermal subcoolers. T.M.

N82-24288*# General Dynamics/Convair, San Diego, Calif.
LOW-THRUST CHEMICAL PROPULSION SYSTEM PROPELLANT EXPULSION AND THERMAL CONDITIONING STUDY
F. Merino, I. Wakabayashi, R. L. Pleasant, and M. Hill Apr. 1982 210 p refs
(Contract NAS3-22650)
(NASA-CR-167841; GDC-NAS-82-002; NAS 1.26:167841)
Avail: NTIS HC A10/MF A01 CSCL 21H

Thermal conditioning systems for satisfying engine net positive suction pressure (NPSP) requirements, and propellant expulsion systems for achieving propellant dump during a return-to-launch site (RTLS) abort were studied for LH2/LO2 and LCH4/LO2 upper stage propellant combinations. A state-of-the-art thermal conditioning system employing helium injection beneath the liquid surface shows the lowest weight penalty for LO2 and LCH4. A technology system incorporating a thermal subcooler (heat exchanger) for engine NPSP results in the lowest weight penalty for the LH2 tank. A preliminary design of two state-of-the-art and two new technology systems indicates a weight penalty difference too small to warrant development of a LH2 thermal subcooler. Analysis results showed that the LH2/LO2 propellant expulsion system is optimized for maximum dump line diameters, whereas the LCH4/LO2 system is optimized for minimum dump line diameter (LCH4) and maximum dump line diameter (LO2). The primary uncertainty is the accurate determination of two-phase flow rates through the dump system; experimentation is not recommended because this uncertainty is not considered significant. Author

N82-24289*# AiResearch Mfg. Co., Phoenix, Ariz.
STUDY OF REACTOR BRAYTON POWER SYSTEMS FOR NUCLEAR ELECTRIC SPACECRAFT
28 Sep. 1979 169 p refs Prepared for JPL, Pasadena, Calif. Original contains color illustrations
(Contract JPL-955008)
(NASA-CR-168942; NAS 1.26:168942; AiResearch-31-3321)
Avail: NTIS HC A08/MF A01 CSCL 21C

The feasibility of using Brayton power systems for nuclear electric spacecraft was investigated. The primary performance parameters of systems mass and radiator area were determined for systems from 100 to 1000 kW sub e. Mathematical models of all system components were used to determine masses and volumes. Two completely independent systems provide propulsion power so that no single-point failure can jeopardize a mission. The waste heat radiators utilize armored heat pipes to limit meteorite puncture. The armor thickness was statistically determined to achieve the required probability of survival. A 400 kW sub e reference system received primary attention as required by the contract. The components of this system were defined and a conceptual layout was developed with encouraging results. An arrangement with redundant Brayton power systems having a 1500 K (2240 F) turbine inlet temperature was shown to be compatible with the dimensions of the space shuttle orbiter payload bay. B.W.

N82-24290# Princeton Univ., N. J. Dept. of Mechanical and Aerospace Engineering.
RESEARCH ON UNSTEADY COMBUSTION PROCESSES Final Report, 1 Oct. 1975 - 30 Sep. 1981
D. B. Bliss Nov. 1981 20 p refs
(Grant AF-AFOSR-3104-76; AF Proj. 2308)
(AD-A110541; AFOSR-82-0022TR) Avail: NTIS HC A02/MF A01 CSCL 21/8

Dynamic responses of rocket motors and aluminum combustion under rocket motor conditions were investigated and the results related to combustion stability and motor efficiency. The first part of the study is centered around the Forced Longitudinal Wave Motor, which was developed to investigate the dynamic responses of high performance rocket motors in which externally excited longitudinal pressure and velocity waves produce couplings with propellant combustion processes. A linear analysis revealed that the imaginary part of the velocity coupling response can be deduced from the phase angle between the nozzle- and head-end responses and that a precise knowledge of the pressure coupling response is not required. Acoustic velocity measurements were achieved using a magnetic flowmeter. Velocity and pressure coupled response data were obtained for AP/HTPB propellants. In the second part of the study, the combustion and agglomeration processes of aluminum particles burning under rocket motor conditions were investigated. Burning aluminum agglomerates were photographed as they passed through a subsonic nozzle. The velocity differential between the agglomerates and the gas deformed the agglomerates causing them to break up. A break-up criterion based on the ratio of shear to surface tension forces was developed. Agglomeration processes were characterized and modelled. Author (GRA)

N82-24291# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
PERFORMANCE CHARACTERISTICS OF CLUSTERED NOZZLES M.S. Thesis
David V. Hibson Dec. 1981 72 p refs
(AD-A111130; AFIT/GAE/AA/81D-14) Avail: NTIS HC A04/MF A01 CSCL 21/8

This is an experimental evaluation of the thrust performance of 3 sets of clustered, three-dimensional, converging-diverging, cold flow supersonic nozzles. A cluster of 2, 4 and 6 nozzles were designed and fabricated. Each cluster assembly has the same geometry in that their area ratio, expansion ratio, and total throat area is the same. A single nozzle with the same geometry and total throat area was used to evaluate the creditability of the testing procedure and the performance of the 3 sets of clustered nozzles. The thrust performance of each nozzle cluster was evaluated by comparison of the measured thrust coefficient of the cluster to that of a single nozzle. The nozzle with the highest thrust coefficient was the cluster of 2 nozzles. Its performance was closely followed by the cluster of 4 nozzles. The nozzle with the lowest thrust coefficient was the cluster of 6 nozzles. The results of this study indicate that the clustering of nozzles improves the thrust performance.
Author (GRA)

N82-24292# Technische Universitaet, Munich (West Germany). Lehrstuhl fuer Raumfahrttechnik.
ON PROPULSIVE OPTIMIZATION OF SPACE TRANSPORTATION ROCKET VEHICLES
H. O. Ruppe Aug. 1981 42 p refs
(TUM-LRT-TB-81/8) Avail: NTIS HC A03/MF A01

The optimization of the payload mass of single stage rocket vehicles is discussed. The free parameters, e.g., Earth radiation effects on solar arrays, prevent a general solution, so a much simplified scheme is proposed. Initial vehicle location and velocity are selected. The relation between these and initial vehicle mass is computed. Carrier rocket selection is based on the result of this computation. The cost of the unfuelled carrier, fuel, launcher-space vehicle integration, transportation to orbital position, and flight operation until end of mission is considered constant. Free parameters e.g., launch time, are chosen so that payload mass, or payload mass/initial vehicle mass, is maximized by trajectory optimization and vehicle mass allocation. Solutions for constant and variable exhaust speeds are shown. Ion engine performance is analyzed. Author (ESA)

N82-24293# European Space Agency, Paris (France).
PHYSICAL RESULTS AND PROBLEMS OCCURRING DURING QUALIFICATION OF THE RIT-10 THRUSTER Ph.D. Thesis - Justus-Liebig Univ., Giessen, West Germany
Eberhard Zeyfang Feb. 1982 116 p refs Transl. into GERMAN from "Physik. Aussagen u. Probl. bei der qualifikation des Triebwerks RIT-10", Rept. DFVLR-FB-81-03 DFVLR, Stuttgart, Sep. 1980
(ESA-TT-718; DFVLR-FB-81-03) Avail: NTIS HC A06/MF A01; original report in GERMAN available at DFVLR, Cologne DM 27.80

As part of the qualification of the radio frequency ion thruster, RIT-10, a preliminary life test on three thrusters was carried out. During this test run in a special test facility, 8200 thrusting hours of continuous operation and, in a cycling mode, 2200 hours of thrust at 1100 cycles were achieved. The low increase of thruster input power and the decrease of optimal negative high voltage can be correlated to erosion of the extraction holes by ion impact. The life test data lead to a calculated lifetime limit for RIT-10 of more than 10,000 hours. Author (ESA)

N82-25113 Thiokol Corp., Brigham City, Utah.
MX STAGE 1
P. R. Dykstra *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 1 May 1981 p 1-12 (For primary document see N82-25112 15-99)
(Contract F04704-78-C-0009)
Copyright. Avail: NTIS HC $60.50/MF $60.50 CSCL 21/8

N82-25114 Thiokol Corp., Brigham City, Utah.
MX FIRST STAGE NOZZLE DEVELOPMENT
G. C. Lamere, A. R. Canfield, M. B. Kuwana, and A. L. Chambers *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 1 May 1981 p 13-28 (For primary document see N82-25112 15-99)
(Contract F04704-78-C-0009)
Copyright. Avail: NTIS HC $60.50/MF $60.50 CSCL 21/8

N82-25123 Acurex Corp., Mountain View, Calif. Aerotherm Div.
PARTICULATE IMPACT EROSION IN ENTRANCE-THROAT REGION OF SOLID ROCKET NOZZLES
Z. Chiba *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 1 May 1981 p 175-187 refs (For primary document see N82-25112 15-99)
(Contract F04611-79-C-0012)
Copyright. Avail: NTIS HC $60.50/MF $60.50 CSCL 21/8

N82-25124 Vought Corp., Dallas, Tex.
SOLID ROCKET PROPULSION FOR HYPERVELOCITY MISSILES
L. D. Cardwell *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 1 May 1981 p 189-212 (For primary document see N82-25112 15-99)
Copyright. Avail: NTIS HC $60.50/MF $60.50 CSCL 21/8

N82-25125 Purdue Univ., Lafayette, Ind. Dept. of Mechanical Engineering.
SCARFED NOZZLE FLOW FIELD COMPUTATIONS
J. Vadyak and J. D. Hoffman *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 1 May 1981 p 213-234 refs (For primary document see N82-25112 15-99)
(Contract DAAG29-78-G-0992)
Copyright. Avail: NTIS HC $60.50/MF $60.50 CSCL 21/8

N82-25129 Atlantic Research Corp., Gainesville, Va.
IMPROVED NOZZLELESS PERFORMANCE PROGRAM
Catherine M. Yezzi, M. K. King, I. M. Procinsky, and D. Coats (Software and Engineering Associates, Inc.) *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 1 May 1981 p 307-337 refs (For primary document see N82-25112 15-99)
Copyright. Avail: NTIS HC $60.50/MF $60.50 CSCL 21/8

N82-25130 Aerojet Tactical Systems, Sacramento, Calif.
CORROSION OF ROCKET NOZZLE METALLIC THROATS IN OXIDIZING PROPELLANT ENVIRONMENTS
R. Brogan *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 1 May 1981 p 339-352 refs (For primary document see

N82-25112 15-99)
Copyright. Avail: NTIS HC $60.50/MF $60.50 CSCL 21/8

N82-25131 Naval Weapons Center, China Lake, Calif.
NAVAL HIGH PERFORMANCE OPTIONS
R. W. Feist *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 1 May 1981 p 353-356 (For primary document see N82-25112 15-99)
Copyright. Avail: NTIS HC $60.50/MF $60.50 CSCL 21/8

N82-25140 Martin Marietta Aerospace, Denver, Colo.
MX LAUNCHER INTEGRAL GAS GENERATOR CONCEPT (1)
J. A. McKinnis and A. R. OConnell *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 1 May 1981 p 473-490 (For primary document see N82-25112 15-99)
(Contracts F04704-78-)C-0016; F04704-80-C-0044)
Copyright. Avail: NTIS HC $60.50/MF $60.50 CSCL 21/8

N82-25141 Tally Industries, Inc., Mesa, Ariz.
DEMONSTRATION OF A LONG BURN GAS GENERATOR
G. B. Pogue and R. E. Scott *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 1 May 1981 p 491-498 (For primary document see N82-25112 15-99)
Copyright. Avail: NTIS HC $60.50/MF $60.50 CSCL 21/8

N82-25142* Aerojet Liquid Rocket Co., Sacramento, Calif.
ADVANCED OXYGEN-HYDROCARBON EARTH-TO-ORBIT PROPULSION
C. J. O'Brien *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 1 May 1981 p 499-514 refs (For primary document see N82-25112 15-99)
(Contract NAS8-33452)
Copyright. Avail: NTIS HC $60.50/MF $60.50 CSCL 21/8

N82-25144* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SPACE SHUTTLE SRM PERFORMANCE IMPROVEMENT
C. A. Speak, R. K. Wilks, and K. W. Jones *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 1 May 1981 p 527-542 Prepared in cooperation with Thiokol Corp., Brigham City, Utah (For primary document see N82-25112 15-99)
Copyright. Avail: NTIS HC $60.50/MF $60.50 CSCL 21/8

N82-25145 McDonnell-Douglas Astronautics Co., St. Louis, Mo.
DESIGN OF THE (STS) AFT PROPULSION SUBSYSTEM FOR LONG LIFE
Thomas F. Schweickert *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 1 May 1981 p 543-553 ref (For primary document see N82-25112 15-99)
Copyright. Avail: NTIS HC $60.50/MF $60.50 CSCL 21/8

N82-25147 McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.
PAYLOAD ASSIST MODULE NUTATION CONTROL SYSTEM
B. T. Schoonover, J. F. Willacker, and W. W. Wilson (Rocket Research Co., Redmond, Wash.) *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 1 May 1981 p 587-606 (For primary document see N82-25112 15-99)
Copyright. Avail: NTIS HC $60.50/MF $60.50 CSCL 21/8

N82-25148 Boeing Aerospace Co., Seattle, Wash.
HYDRAZINE PRESSURE SURGES INTO AN EVACUATED MANIFOLD ASSEMBLY
Philip J. Knowles *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 1 May 1981 p 607-627 refs (For primary document see N82-25112 15-99)
(Contract F04701-78-C-0040)
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N82-25150# Boeing Aerospace Co., Seattle, Wash.
DEMONSTRATION OF A SIMPLE DEVICE TO START AN OVERCONTRACTED MIXED COMPRESSION INLET
B. M. Dunn and L. E. Fink *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 2 May 1981 p 1-19 refs (For primary document see N82-25149 15-99)
Avail: NTIS HC $60.50/MF $60.50 CSCL 21/8

N82-25151# Atlantic Research Corp., Gainesville, Va.
TRANSITION STUDIES FOR A SOLID FUEL INTEGRAL ROCKET RAMJET
P. S. Kunkel and C. R. Limage *In* APL The 1980 JANNAF Propulsion Meeting, Vol. 2 May 1981 p 21-32 (For primary document see N82-25149 15-99)
Avail: NTIS HC $60.50/MF $60.50 CSCL 21/8

N82-25155# Naval Weapons Center, China Lake, Calif.
WATER TUNNEL AND WINDOWED COMBUSTION AS TOOLS FOR DUCTED ROCKET DEVELOPMENT
K. C. Schadow and D. J. Chieze *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 2 May 1981 p 101-115 refs (For primary document see N82-25149 15-99)
Avail: NTIS HC $60.50/MF $60.50 CSCL 21/8

N82-25156# Atlantic Research Corp., Gainesville, Va.
SIMULATION OF THE INTEGRAL ROCKET RAMJET FLIGHT REGIME IN A GROUND-BASED TEST FACILITY
B. J. Brien *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 2 May 1981 p 117-140 (For primary document see N82-25149 15-99)
Avail: NTIS HC $60.50/MF $60.50 CSCL 21/8

N82-25158* Jet Propulsion Lab., California Inst. of Tech., Pasadena.
PLANETARY PUMP FED PROPULSION SYSTEM ENGINEERING MODEL TEST RESULTS
M. P. Zydowicz, L. K. Jones, and P. N. Estey *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 2 May 1981 p 159-175 refs (For primary document see N82-25149 15-99)
(Contract NAS7-100)
Avail: NTIS HC $60.50/MF $60.50 CSCL 21/8

N82-25159*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
A PUMP FED PROPULSION SYSTEM FOR EARTH ORBITING SATELLITES
Paul N. Estey *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 2 May 1981 p 177-189 refs (For primary document see N82-25149 15-99)
(Contract NAS7-100)
Avail: NTIS HC $60.50/MF $60.50 CSCL 21/8

N82-25161# Marquardt Corp., Van Nuys, Calif.
INSAT-1 SATELLITE PROPULSION SUBSYSTEM DESIGN AND TEST
R. C. Stechman and C. K. Drenning *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 2 May 1981 p 215-229 (For primary document see N82-25149 15-99)
Avail: NTIS HC $60.50/MF $60.50 CSCL 21/8

N82-25162*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
PULSED PLASMA THRUSTER IGNITION STUDY
G. Aston and L. C. Pless *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 2 May 1981 p 231-244 refs (For primary document see N82-25149 15-99)
(Contracts F04611-78-X-0034; F04611-80-X-0041)
Avail: NTIS HC $60.50/MF $60.50 CSCL 21/3

N82-25163# TRW Defense and Space Systems Group, Redondo Beach, Calif.
MISSION INTEGRATION STUDY FOR SOLID TEFLON PULSED PLASMA MILLIPOUND PROPULSION SYSTEM
Marshall Huberman, Sidney Zafran, M. Henry Gran, and J. M. Sellen *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 2 May 1981 p 245-263 refs (For primary document see N82-25149 15-99)
(Contract F04611-78-C-0064)
Avail: NTIS HC $60.50/MF $60.50 CSCL 20/8

N82-25164# Air Force Rocket Propulsion Lab., Edwards AFB, Calif.
THE PLACE OF SOLAR THERMAL ROCKETS IN SPACE
C. C. Selph *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 2 May 1981 p 265-288 refs (For primary document see

N82-25149 15-99)
Avail: NTIS HC $60.50/MF $60.50 CSCL 21/8

N82-25165# TRW Systems Group, Redondo Beach, Calif.
EXPERIMENTAL DATA FOR A ONE METER DIAMETER PULSED INDUCTIVE PLASMA THRUSTER WITH APPLICATION TO A 25 KW MISSION
C. L. Dailey and R. H. Lovberg (California Univ., La Jolla) *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 2 May 1981 p 289-307 refs (For primary document see N82-25149 15-99)
Avail: NTIS HC $60.50/MF $60.50 CSCL 21/8

N82-25166# Air Force Rocket Propulsion Lab., Edwards AFB, Calif.
AN ADVANCED HIGH ENERGY DENSITY CAPACITOR EVALUATION SYSTEM
T. Becker and J. R. Freeman *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 2 May 1981 p 309-323 refs (For primary document see N82-25149 15-99)
Avail: NTIS HC $60.50/MF $60.50 CSCL 21/8

23 CHEMISTRY AND MATERIALS (GENERAL)

Includes biochemistry and organic chemistry.

N82-24294# National Bureau of Standards, Washington, D.C.
STANDARD REFERENCE DATA PUBLICATIONS, 1964-1980
Gertrude B. Sherwood Nov. 1981 125 p
(PB82-134362; NBS-SP-612) Avail: NTIS HC A06/MF A01 CSCL 07D

A comprehensive list of the outputs of the National Standard Reference Data System (NSRDS) is presented including author, materials, and property indexes for the years 1964-1980. Evaluated data bases of physical and chemical properties of substances are available in printed form, on magnetic tapes, and through online computer networks. GRA

N82-24295# National Bureau of Standards, Washington, D.C. National Measurement Lab.
NBS STANDARD REFERENCE MATERIALS CATALOG
R. W. Seward Nov. 1981 125 p
(PB82-138140; NBS-SP-260) Avail: NTIS HC A06/MF A01 CSCL 07D

This catalog lists those standard reference materials, research materials, and special reference materials that are available from the National Bureau of Standards and those that are soon to be available. These materials are described as to their certified characterization, unit size, and type. Ordering information is included. Prices for these materials are listed separately in annual supplements to this catalog. GRA

24 COMPOSITE MATERIALS

Includes laminates.

N82-24296* National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Center, Edwards, Calif.
SUPERPLASTICALLY FORMED DIFFUSION BONDED METALLIC STRUCTURE Patent
William L. Ko, inventor (to NASA) Issued 29 Sep. 1981 8 p Filed 30 May 1979 Supersedes N79-25424 (17 - 16, p 2136)
(NASA-Case-FRC-11026-1; US-Patent-4,292,375; US-Patent-Appl-SN-043944; US-Patent-Class-428-593; US-Patent-Class-228-157; US-Patent-Class-244-119; US-Patent-Class-244-123; US-Patent-Class-428-604; US-Patent-Class-428-594) Avail: US Patent and Trademark Office CSCL 11D

A metallic sandwich structure particularly suited for use in aerospace industries comprising a base plate, a cover plate, and an orthogonally corrugated core is described. A pair of core plates formed of a superplastic alloy are interposed between the base plate and the cover plate and bonded. Each of the core plates is characterized by a plurality of protrusions comprising square-based, truncated pyramids uniformly aligned along orthogonally related axes perpendicularly bisecting the legs of the bases of the pyramids and alternately inverted along orthogonally related planes diagonally bisecting the pyramids, whereby an orthogonally corrugated core is provided.
Official Gazette of the U.S. Patent and Trademark Office

N82-24297*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FACTORS INFLUENCING THE THERMALLY-INDUCED STRENGTH DEGRADATION OF B/Al COMPOSITES
James A. DiCarlo 1982 17 p refs Presented at the Symp. on Failure Modes in Metal Matrix Composites, Dallas, 15-18 Feb. 1982; sponsored by Am. Inst. of Mining, Met. and Petrol. Engr.
(NASA-TM-82823; E-1175; NAS 1.15:82823) Avail: NTIS HC A02/MF A01 CSCL 11D

Literature data related to the thermally-induced strength degradation of B/Al composites were examined in the light of fracture theories based on reaction-controlled fiber weakening. Under the assumption of a parabolic time-dependent growth for the interfacial reaction product, a Griffith-type fracture model was found to yield simple equations whose predictions were in good agreement with data for boron fiber average strength and for B/Al axial fracture strain. The only variables in these equations were the time and temperature of the thermal exposure and an empirical factor related to fiber surface smoothness prior to composite consolidation. Such variables as fiber diameter and aluminum alloy composition were found to have little influence. The basic and practical implications of the fracture model equations are discussed. Author

N82-24298*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
MODELING STIFFNESS LOSS IN BORON/ALUMINUM BELOW THE FATIGUE LIMIT
W. S. Johnson Mar. 1982 32 p refs Presented at the ASTM Symp. on the Long-Term Behavior of Composites, Williamsburg, Va., 9-10 Mar. 1982
(NASA-TM-83294; NAS 1.15:83294) Avail: NTIS HC A03/MF A01 CSCL 11D

Boron/aluminum can develop significant internal matrix cracking when fatigued. These matrix cracks can result in a 40 percent secant modulus loss in some laminates, even when fatigued below the fatigue limit. It is shown that the same amount of fatigue damage will develop during stress or strain-controlled tests. Stacking sequence has little influence on secant modulus loss. The secant modulus loss in unidirectional composites is small, whereas the losses are substantial in laminates containing off-axis plies. A simple analysis is presented that predicts unnotched laminate secant modulus loss due to fatigue. The analysis is based upon the elastic modulus and Poisson's ratio of the fiber and matrix, fiber volume fraction, fiber orientations, and the cyclic-hardened yield stress of the matrix material. Excellent agreement was achieved between model predictions and experimental results. With this model, designers can project the material stiffness loss for design load or strain levels and assess the feasibility of its use in stiffness-critical parts. B.W.

N82-24299*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
WATER ABSORPTION AND DESORPTION IN SHUTTLE ABLATOR AND INSULATION MATERIALS
A. F. Whitaker, C. F. Smith, V. A. Wooden, B. E. Cothren, and H. Gregory Feb. 1982 33 p
(NASA-TM-82472; NAS 1.15:82472) Avail: NTIS HC A03/MF A01 CSCL 11D

Shuttle systems ablator and insulation materials underwent water soak with subsequent water desorption in vacuum. Water accumulation in these materials after a soak for 24 hours ranged from +1.1% for orbiter tile to +161% for solid rocket booster MSA-1. After 1 minute in vacuum, water retention ranged from none in the orbiter tile to +70% for solid rocket booster cork.
R.J.F.

N82-24300*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

DESIGNING WITH FIGER-REINFORCED PLASTICS (PLANAR RANDOM COMPOSITES)

Christos C. Chamis Washington Mar. 1982 26 p refs

(NASA-TM-82812; E-1155; NAS 1.15:82812) Avail: NTIS HC A03/MF A01 CSCL 11D

The use of composite mechanics to predict the hygrothermomechanical behavior of planar random composites (PRC) is reviewed and described. These composites are usually made from chopped fiber reinforced resins (thermoplastics or thermosets). The hygrothermomechanical behavior includes mechanical properties, physical properties, thermal properties, fracture toughness, creep and creep rupture. Properties are presented in graphical form with sample calculations to illustrate their use. Concepts such as directional reinforcement and strip hybrids are described. Typical data that can be used for preliminary design for various PRCs are included. Several resins and molding compounds used to make PRCs are described briefly. Pertinent references are cited that cover analysis and design methods, materials, data, fabrication procedures and applications. Author

N82-24301*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

STANDARD TESTS FOR TOUGHENED RESIN COMPOSITES

May 1982 29 p refs

(NASA-RP-1092; L-15317; NAS 1.61:1092) Avail: NTIS HC A03/MF A01 CSCL 11D

Several toughened resin systems are evaluated to achieve commonality for certain kinds of tests used to characterize toughened resin composites. Specifications for five tests were standardized; these test standards are described. S.L.

N82-24302*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

THREE-DIMENSIONAL ANALYSIS OF [0/90]S AND [90/0]S LAMINATES WITH A CENTRAL CIRCULAR HOLE

Ivatury S. Raju and John H. Crews, Jr. Apr. 1982 37 p refs Submitted for publication

(NASA-TM-83300; NAS 1.15:83300) Avail: NTIS HC A03/MF A01 CSCL 11D

Stress distributions were calculated near a circular hole in laminates, using a three dimensional finite element analysis. These stress distributions were presented three ways: through the thickness at the hole boundary, along radial lines at the 0/90 and 90/0 interfaces, and around the hole at these interfaces. The interlaminar normal stress, and the shear stress, distributions had very steep gradients near the hole boundary, suggesting interlaminar stress singularities. The largest compressive stress occurred at about 60 deg from the load axis. A simple procedure was introduced to calculate interlaminar stresses near the hole boundary. It used stresses calculated by an exact two dimensional analysis of a laminate with a hole as input to a quasi three dimensional model. It produced stresses that agreed closely with those from the three dimensional finite element model. S.L.

N82-24303# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany). Inst. fuer Strukturmechanik.

DAMAGE MECHANICS FOR FIBER REINFORCED COMPOSITE STRUCTURES

Jun. 1981 227 p refs Partly in GERMAN and ENGLISH Presented at Strukturmech.-Kolloq., Brunswick, 25 Jun. 1981 Report will also be announced as translation (ESA-TT-758)

(DFVLR-Mitt-81-25; ESA-TT-758) Avail: NTIS HC A11/MF A01; DFVLR, Cologne DM 71,10

The development of principles of damage mechanics for composite materials analogous to fracture mechanics for metals was surveyed. Because of the large number of possible kinds of damage and the heterogeneity of the materials, the scope and the degree of difficulty exceed those of fracture mechanics. The main tasks of the study were the detection and identification of defects by suitable nondestructive test methods as well as the prediction of their significance under realistic service conditions. For individual titles, see N82-24304 through N82-24309.

N82-24304# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany).

NONDESTRUCTIVE TESTING OF CFRP LAMINATES [ZERSTOERUNGSFREIE PRUEFUNG VON CFK-LAMINATEN]

W. Hillger and R. Schuetze *In its* Damage Mech. for Fiber Reinforced Composite Struct. Jun. 1981 p 11-43 refs In GERMAN; ENGLISH summary (For primary document see N82-24303 15-24)

Avail: NTIS HC A11/MF A01; DFVLR, Cologne DM 71,10

Ultrasonic and X-ray, nondestructive test methods were developed. The use of ultrasonic fault detection on laminated CFRP sheets was emphasized. Ultrasonic precision test equipment was assembled and a transducer was adapted for the detection of delaminations. Ultrasonic test results obtained with 1.5 to 3.2 mm thick CFRP laminates with different internal defects demonstrate a high level of resolution. The measurements are validated by X-ray imagery and by destructive tests. Two series of scans show the progression of laminations during repeated loading. The results of improved X-ray analysis, using a contrast agent (tetrabromethane), are also included. Author (ESA)

N82-24305# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany).

MONITORING DAMAGE PROGRESSION IN CFRP BY ACOUSTIC EMISSION

Jonathan Awerbuch (Drexel Univ., Philadelphia) *In its* Damage Mech. for Fiber Reinforced Composite Struct. Jun. 1981 p 45-83 (For primary document see N82-24303 15-24)

Avail: NTIS HC A11/MF A01; DFVLR, Cologne DM 71,10

Damage initiation and progression were monitored through acoustic emission in a variety of graphite/epoxy T300/914C laminates. The monitoring of acoustic emission as a nondestructive test technique was evaluated. Data recorded include: accumulative events and counts; count rate and number of counts per event as a function of load; line location and amplitude distribution histograms of events; and the cumulative events amplitude distributions at different load levels, all for emissions occurring within a preset area of interest along the specimen. The results demonstrate the potential for using acoustic emission to locate existing damage, detect and track damage initiation and progression, identify potential fracture sites, and possibly distinguish between the major failure mechanisms of different laminates, all of which ultimately aid in forecasting the strength and life of individual specimens during proof testing. Proper test methodology is emphasized, identifying pitfalls. Author (ESA)

N82-24306# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany).

EFFECT OF ENVIRONMENTAL INFLUENCES ON THE MECHANICAL PROPERTIES OF CFRP [AUSWIRKUNG VON UMWELTEINFLUESSEN AUF DIE MECHANISCHEN EIGENSCHAFTEN VON CFK]

M. Gaedke *In its* Damage Mech. for Fiber Reinforced Composite Struct. Jun. 1981 p 85-119 refs In GERMAN; ENGLISH summary (For primary document see N82-24303 15-24)

Avail: NTIS HC A11/MF A01; DFVLR, Cologne DM 71,10

Hygrothermal, thermal and radiation degradation of carbon fiber reinforced plastics were studied. Specific aerospace environmental conditions affect mechanical properties, such as strength and moduli. Variations in these properties, either decreasing or increasing, were determined. The test program and procedures are described. Test results demonstrate that environmental moisture and temperature parameters cause a decrease in mechanical strength and elasticity. Thermal cycling (+95 to -155 C) is particularly detrimental, while outgassing is also related to temperature. Results of electron irradiation show degradation similar to thermal damage. Author (ESA)

N82-24307# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany).

FATIGUE DAMAGE PROPAGATION IN CFRP DUE TO LOADING

R. Prinz *In its* Damage Mech. for Fiber Reinforced Composite Struct. Jun. 1981 p 121-165 refs In GERMAN; ENGLISH summary (For primary document see N82-24303 15-24)

Avail: NTIS HC A11/MF A01; DFVLR, Cologne DM 71,10

A damage model based on delamination propagation between

the plies of a multidirectional laminate due to tension-compression fatigue was developed. The results of finite element calculations of load transfer on the edges of the specimens were compared with observations of delamination initiation during tests. These defects propagate due to interlaminar stresses up to an area which is critical for buckling of parts of the delaminated test specimens. Good correlation between experimentally observed residual strength after cyclic loading and analytical predictions, given the statistical scatter of test results, is shown.
Author (ESA)

N82-24308# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany).
LAYER MODEL FOR CALCULATING STRESS IN DEBONDED ZONES [SCHICHTENMODELLE ZUR BERECHNUNG DER SPANNUNGEN IN STOERZONEN]
H. Eggers *In its* Damage Mech. for Fiber Reinforced Composite Struct. Jun. 1981 p 167-196 refs In GERMAN; ENGLISH summary (For primary document see N82-24303 15-24)
Avail: NTIS HC A11/MF A01; DFVLR, Cologne DM 71,10

An extended layer model is presented with which stress and crack propagation in a debonded zone can be calculated with sufficient accuracy while preserving computational economy. Every fiber structure contains small flaws where the fibers are partially debonded. The kind and size of flaws that can be tolerated without damaging the whole structure intrinsically are discussed. The propagation of an initial crack within the flaw is described. The three-dimensional stress state around a flaw which is imbedded in a larger structure is calculated. Results, using specialized finite elements in order to determine the stress state in flat-fiber reinforced shells with layer cracks and delaminations, are shown.
Author (ESA)

N82-24309# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Brunswick (West Germany).
MECHANISMS AND KNOWN VALUES FOR THE INFLUENCE OF ENVIRONMENTAL CONDITIONS ON CFRP [MECHANISEM UND KENNWERTE DES EINFLUSSES VON E UNWELTBEDINGUNGEN AUF DAS VERHALTEN VON CFK]
P. Nitsch *In its* Damage Mechanics for Fiber Reinforced Composite Struct. Jun. 1981 p 197-226 refs In GERMAN; ENGLISH summary (For primary document see N82-24303 15-24)
Avail: NTIS HC A11/MF A01; DFVLR, Cologne DM 71,10

Degradation mechanisms and characteristic values for environmental effects on graphite-epoxy composite materials are discussed with reference to aeronautics. The generally attractive strength properties of CFRP tend to diminish under the influence of irradiation, thermal cycling, and moisture. Quantitative results are shown for UV radiation damage, temperature dependence (including outgassing), and for effects of moisture content.
Author (ESA)

N82-24310# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
MOISTURE AND TEMPERATURE EFFECTS ON THE INSTABILITY OF CYLINDRICAL COMPOSITE PANELS M.S. Thesis
James M. Snead Dec. 1981 172 p refs
(AD-A111127; AFIT/GAE/AA/81D-29) Avail: NTIS HC A08/MF A01 CSCL 01/3

An analytical investigation was performed to evaluate the influences of moisture and temperature on the bifurcation load of cylindrical, composite panels subject to axial loading. The composite panels were 8-ply graphite/epoxy (AS/3501-5) laminates. The laminate ply orientations considered were (0., 45., -45., 90.) S, (90., 45., -45., 0.) S, and (45., -45.) 2S. The analysis included several different panel radii, two sets of boundary conditions, and three sets of initial moisture conditions. To evaluate the influences of moisture and temperature, the transverse moduli, E2, and shear moduli, G12, were degraded based on test data for the AS/3501-5 system. Each ply orientation was evaluated at 20 time/temperature conditions that ranged from 80 F to 300 F and moisture concentrations ranging from zero moisture content to an equilibrium moisture concentration distribution. The bifurcation loads were determined using the STAGS-C1 finite element shell analysis program. The bifurcation analysis mode with a pre-buckled linear displacement option was used for the analysis. Moisture and temperature were found to cause a reduction in the panels' bifurcation load ranging from 20.6 percent for the (0., 45., -45., 90.)S laminate to 42.7 percent for the (45., -45.) 2S laminate.
Author (GRA)

N82-24311# National Aerospace Lab., Amsterdam (Netherlands). Structures and Materials Div.
A SHORT NOTE ON THE INTERPRETATION OF X-RAY RADIOGRAPHS OF CARBON FIBER REINFORCED COMPOSITES
E. A. B. deGraaf, K. J. Rienks (Royal Netherlands Aircraft Factories Fokker, Amsterdam), and W. H. M. vanDreumel (Delft Univ. of Technology) Sep. 1980 13 p ref
(Contract NIVR-1893)
(NLR-TR-80089-U) Avail: NTIS HC A02/MF A01

The X-ray radiography and subsequent destructive investigation according to metallographic techniques of specimens taken from experimental mixed laminate test wing panels is described. Results show that white lines in printed radiographs are caused by the absence of resin, particularly in the case of air or gas channels. Dark lines are caused by resin channels. Local differences in overall gray level, corresponding to fiber orientation, are caused by differences in fiber volume fraction. More fibers means less attenuation, or lighter gray in printed radiographs. Mixed laminates concept produces relatively poor quality laminates if no special precautions are taken to absorb excess resin, especially for thin laminate cores.
Author (ESA)

25 INORGANIC AND PHYSICAL CHEMISTRY

Includes chemical analysis, e.g., chromatography; combustion theory; electrochemistry; and photochemistry.

For related information see also *77 Thermodynamics and Statistical Physics*.

N82-24312* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
THE 1,1,1-TRIARYL-2,2,2-TRIFLUOROETHANES AND PROCESS FOR THEIR SYNTHESIS Patent
William D. Kray (Talladega Coll.) and Robert W. Rosser, inventors (to NASA) Issued 22 Dec. 1981 5 p Filed 30 Mar. 1978 Supersedes N78-21154 (16 - 13, p 1674)
(NASA-Case-ARC-11097-1; US-Patent-4,307,024; US-Patent-Appl-SN-891872; US-Patent-Class-260-389; US-Patent-Class-260-386; US-Patent-Class-570-123; US-Patent-Class-570-129; US-Patent-Class-528-402) Avail: US Patent and Trademark Office CSCL 07D

New 1,1,1-triaryl-2,2,2-trifluoroethanes in which the aryl radicals carry one or more substituents were prepared by condensation of trifluoroacetophenones with substituted phenyl compounds in the presence of catalytic quantities of trifluoromethylsulfonic acid. The reaction can be carried out under reflux in toluene or, for strikingly better results in certain cases, reactants are simply stirred at room temperature for about 24 to 48 hours.
Author

N82-24313# Washington Univ., Seattle. Lab. for Chemometrics.
FUNDAMENTAL REVIEW CHEMOMETRICS Interim Report
Ildiko E. Frank and Bruce R. Kowalski Feb. 1982 78 p refs
(Contract N00014-75-C-0536)
(AD-A111817; Rept-22) Avail: NTIS HC A05/MF A01 CSCL 07/4

During the last two years since Chemometrics became a formal entry in the Fundamental Reviews issue of ANALYTICAL CHEMISTRY the topic has been defined, taught, expanded, matured and hopefully, brought at least a few chemists and statisticians and applied mathematicians a bit closer together. As per the international Chemometrics Society, chemometrics is defined as the chemical discipline that uses mathematical and statistical methods, (a) to design or select optimal measurement procedures and experiments; and (b) to provide maximum chemical

information by analyzing chemical data. In the field of Analytical Chemistry, Chemometrics is the chemical discipline that uses mathematical and statistical methods for the obtention in the optimal way of relevant information on material systems. Even in spite of the formidable barrier of having to learn such topics as multivariate statistics, linear algebra and numerical analysis, analytical chemists are becoming increasingly more interested in and aware of the potential rewards application of the tools from this new sub-discipline can provide. Even a casual perusal through this review should serve to convince the reader that analytical chemistry is beginning to mature as an information science and that analytical chemometrics will change the way analytical methods are developed and then applied. (E1), (E5). The authors prefer to view chemometrics as an interface between chemistry and mathematics. The tools are vehicles that can aid chemists to move more efficiently on the path from measurements to information to knowledge. GRA

N82-24314# National Bureau of Standards, Boulder, Colo. Surface Science Div.

ADSORPTION OF H2 ISOTOPES ON ZnO: COVERAGE INDUCED IR FREQUENCY SHIFTS AND ADSORBATE GEOMETRY

Gregory L. Griffin (Minnesota Univ., Minneapolis) and John T. Yates, Jr. (Pittsburgh Univ., Pa.) Feb. 1982 28 p refs Submitted for publication

(Contract N00014-81-F-0008)

(AD-A111282; TR-25) Avail: NTIS HC A03/MF A01 CSCL 07/4

The coverage dependence of the IR stretching frequencies for dissociative Type I adsorption of H2 and D2 on ZnO powders has been measured using transmission IR spectroscopy. By comparing the frequency shifts observed when the isotopic composition of the adsorbate is varied at constant total coverage with the shifts observed when the total coverage of either pure component is varied, we can separate the dynamic and static contributions to the coverage induced frequency shifts. The ZnH and ZnD shifts are due primarily to electrodynamic interactions. The observed shifts are in good agreement with the Hammaker model for dynamic dipole-dipole interactions, if adsorption is assumed to occur on (2 x 2) reconstructed ZnO (0001) surface planes. In contrast, the OH and OD shifts are due to electrostatic and inductive interactions. The electrostatic contribution can be estimated using a modification of Buckingham's treatment of local environment effects. A qualitative model, based on electron localization effects, is presented to explain the observed inductive contribution. Author (GRA)

N82-24315# Naval Postgraduate School, Monterey, Calif. Dept. of Aeronautics.

DESIGN OF AN APPARATUS FOR THE STUDY OF ELECTROSTATIC EFFECTS ON GAS TURBINE FUEL SPRAYS AND COMBUSTION EFFICIENCY M.S. Thesis

Loren Logan Todd Sep. 1981 37 p refs

(AD-A111151) Avail: NTIS HC A03/MF A01 CSCL 21/4

The theoretical effects of an electrostatic field on the atomization process of a fuel nozzle and the resulting change in flame characteristics and combustion efficiency which can be expected are presented. Included are a discussion of the atomization process, electrostatic effects on fuel droplet size, and combustion of a fuel droplet. To demonstrate electrostatic effects on atomization, a model jet engine combustion chamber was constructed which performed effectively. However, during attempts to introduce the necessary high electric field, the flame grounded the voltage and no definitive results have been obtained. Author (GRA)

N82-24316# Junta de Energia Nuclear, Madrid (Spain). Div. de Quimica y Medio Ambiente.

ANALYSIS OF SODIUM METAL BY X-RAY FLUORESCENCE SPECTROMETRY. (1) DETERMINATION OF Hf, Mo, Nb, Ta, Ti, V AND Zr

J. P. Diaz-Guerra 1981 27 p refs In SPANISH

(DE81-700472; JEN-486) Avail: NTIS (US Sales Only) HC A03/MF A01; DOE Depository Libraries

A method allowing the determination of trace quantities of Hf, Mo, Nb, Ta, Ti, V and Zr in sodium metal previously transformed into Na2SO4 is described. The enrichment of the impurities is performed through a coprecipitation technique in sulfuric medium by using Fe(3) as a collector and cupferron or phenyfluorene as the precipitating reagent. The matrix influence and the best concentration of the collector (10 micrograms/ml), adequate pH(1,3 or 4 respectively) and optimum filter type were studied, as well as the precipitation recoveries corresponding to the reagent above. Better efficiency of the cupferron was demonstrated for determining all the impurities. Detection limits range from 0.01 to 0.2 ppm, depending on the element, for samples 4 g in weight. An automatic spectrometer attached to a 16 k minicomputer and X-ray tube with a gold anode were used. The interferences between the lines ZrK (2nd order) - HfL alpha sub 1 and TiK beta - VK alpha were studied and the respective correction coefficients deduced. DOE

N82-24317# Junta de Energia Nuclear, Madrid (Spain).

DETERMINATION OF COPPER IN GEOLOGICAL MATERIALS BY X-RAY FLUORESCENCE

M. Roca and A. Bayon 1981 19 p refs In SPANISH; ENGLISH summary

(DE81-700474; ; JEN-491) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

The copper content of geological materials in the concentration range of 0.01 to 2t=. CuO was determined. A molybdenum target tube is used, samples being presented in finely ground powder form. Various methods for the correction for background and instrumental copper interferences were considered. To correct for matrix effects, different tube scattered primary radiations were tested as reference or internal standards. MoK provides the most suitable results. The use of influence empirical coefficients for the effect of iron on copper and of mass absorption coefficients were also considered. For samples with a high content of lead, several procedures to correct for its influence were investigated. Comparison between data obtained by X-ray fluorescence and wet chemical techniques indicates good agreement. DOE

N82-24318# California Univ., Berkeley. Lawrence Berkeley Lab. Physics, Computer Science and Mathematics Div.

HOPF BIFURCATION OF A MODEL OF SOLID FUEL COMBUSTION Ph.D. Thesis

Victor Roytburd Aug. 1981 141 p refs

(Contract W-7405-eng-48)

(DE82-002553; LBL-13174) Avail: NTIS HC A07/MF A01

Under some reasonable assumptions, a mathematical model for gasless combustion of one dimensional solid fuel can be reduced to a free boundary problem for a system of semilinear parabolic equations. The problem is in a sense analogous to the two-phase Stefan problem with nonlinear jump conditions related to heat release. Solutions demonstrate behavior typical for the Hopf bifurcation, i.e., loss of stability for the steadily traveling wave solution as a parameter changes and the emergence of a nonlinearily stable pulsating combustion front. A formal bifurcation analysis of these phenomena was carried out recently with the help of asymptotic expansions. A rigorous treatment of some of these results is developed. The problem is considered as an evolution equation in a Hilbert space. To circumvent difficulties with a possible resonance with the continuous spectrum appropriate weighted norms are introduced. A suitable version of the Hopf bifurcation theorem is developed and the existence of time periodic solutions for values of the parameter near some critical value is proved. DOE

N82-24319# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.

INTEGRATED ABSORPTION COEFFICIENTS FOR SEVERAL VIBRATION-ROTATION TRANSITIONS OF THE GAS PHASE HYDROXYL RADICAL USING A TUNABLE DIODE LASER Ph.D. Thesis

James Robert Podolske Sep. 1981 191 p refs

(Contract W-7405-eng-48)

(DE82-001716; LBL-13218) Avail: NTIS HC A09/MF A01

Intergrated absorption coefficients for several vibration-rotation transitions of the gas phase OH radical were measured for the first time. The rate constant for the electronic energy transfer reaction between the excited oxygen molecule, and the ground state HO2 radical was also measured. The molecular modulation technique was combined with high resolution diode laser spectroscopy to observe four OH transitions near

3410 cm(+1). Hydroxyl radicals were produced by the photolysis of O3 at 2537 A in the presence of H2O, and their time-dependent concentration calculated by numerical simulation of the complete photochemical system. Photolysis of O3 in a flow system was performed, both with and without H2O present, and steady state O3 concentrations measured by UV absorption. O2((1) (RADIAL)) is a pried-model for the steel-concrete mixture. DOE

N82-24320# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).
TEMPERATURE AND PRESSURE DEPENDENT INVESTIGATION OF THE REACTIONS NH2 PLUS NO, H PLUS NO2, OH PLUS CO, AND H PLUS C2H4 BY MEANS OF EXCIPLEX LASER PHOTOLYSIS Thesis [TEMPERATUR- UND DRUCKABHAENGIGE UNTERSUCHUNG DER REAKTIONEN NH2 + NO, H + NO2, OH + CO UND H + C2H4 MIT HILFE DER EXCIPLEX-LASERPHOTOLYSE]
Axel Jacobs Aug. 1981 107 p refs In GERMAN
(MPIS-12/1981; ISSN-0436-1199) Avail: NTIS HC A06/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 19.05

In a thermostatically controlled flow system for the study of fast radical reactions, the photolytic effect of an ArF exciplex laser (193 nm) on ammonia, hydrogen peroxide, nitric acid, nitrogen dioxide, and nitrogen oxide was investigated with regard to to Lyman alpha atomic resonance absorption. The reaction velocity of H + C2H4 was measured at room temperature and pressure between 0.5 and 5.5 mbar. The pressure dependent velocity constant of the reaction H + NO2 was determined between 290 and 895 K. The effect of the translation energy of OH radicals on the velocity of the reaction CO + OH was directly measured. The formation of hydrogen atoms or hydroxyl radicals from the reaction of nitrogen oxide with amino radicals was studied. The stochiometry of the reaction NH2 + NO was determined in a static experiment with mass spectrometer, at room temperature and in the pressure domain between 70 mbar and 1 bar. Author (ESA)

N82-24321# National Bureau of Standards, Washington, D.C.
STANDARD REFERENCE MATERIALS: SUMMARY OF THE CLINICAL LABORATORY STANDARDS ISSUED BY THE NATIONAL BUREAU OF STANDARDS Final Report
R. W. Seward and R. Mavrodineanu Nov. 1981 180 p
(PB82-135161; NBS-SP-260-71; LC-81-600149) Avail: NTIS HC A09/MF A01 CSCL 07D

The clinical laboratory standards issued as standard reference materials (SRM's) are summarized and the material, composition, certification, use, and remarks concerning each of the SRM's are presented in tabular form. Copies of the certificates for these SRM's are included. GRA

N82-24892# Austrian Research Center, Seibersdorf.
DEVIATION OF CRACKING PATTERNS AND THEIR INFLUENCE ON RGA ACCURACY
A. Breth and R. Dobrozemsky *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 75-78 Sponsored by Fonds zur Foerderung der Wissenschaftlichen Forschung. (For primary document see N82-24880 15-70)
Avail: NTIS HC A16/MF A01

N82-24893# SRI International Corp., Menlo Park, Calif.
PHOTODETACHMENT OF ELECTRONS FROM NEGATIVE IONS
J. R. Peterson *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 79-82 refs (For primary document see N82-24880 15-70)
Avail: NTIS HC A16/MF A01

N82-24899# Commissariat a l'Energie Atomique, Gif-sur-Yvette (France). Service de Physique des Atomes et des Surfaces.
QUASI-CRYSTALLINE ORGANIC LAYERS STUDIED WITH PHOTO-EMISSION AND META-EMISSION SPECTROSCOPIES
C. Boiziau, C. Juret, G. Lecayon, R. Nuvolone, and C. Reynaud *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 111-116 refs (For primary document see N82-24880 15-70)
Avail: NTIS HC A16/MF A01

N82-24903# Innsbruck Univ. (Austria). Inst. fuer Experimentalphysik.
DIFFUSION TO THE SURFACE IN THE ANNEALING OF RADIATION DAMAGE IN INORGANIC INSULATING SOLIDS
W. Ritter and T. D. Maerk *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 134-140 refs (For primary document see N82-24880 15-70)
Avail: NTIS HC A16/MF A01

N82-24915# Georgia Inst. of Tech., Atlanta. School of Physics.
BASIC MICROSCOPIC THEORY OF CHEMICAL REACTIONS IN DENSE GASES
In Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 216-220 refs (For primary document see N82-24880 15-70)
(Grant AF-AFOSR-80-0055)
Avail: NTIS HC A16/MF A01

N82-25116 Rocketdyne, Canoga Park, Calif.
SYNTHESIS OF ENERGETIC COMPOUNDS
M. B. Frankel, E. R. Wilson, D. O. Woolery, C. L. Hamermesh, and C. McArthur *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 1 May 1981 p 39-50 refs Prepared in cooperation with Rockwell International, Thousand Oaks, Calif. (For primary document see N82-25112 15-99)
(Contract N00014-79-C-0043)
Copyright. Avail: NTIS HC $60.50/MF $60.50 CSCL 07/4

N82-25127 Tally Industries, Inc., Mesa, Ariz.
STUDY OF METALLOCARBORANES AS COMBUSTION MODIFIERS
Indu B. Mishra and C. I. Merrill (AFRPL, Edwards AFB, Calif.) *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 1 May 1981 p 253-285 refs (For primary document see N82-25112 15-99)
Copyright. Avail: NTIS HC $60.50/MF $60.50 CSCL 22/2

26 METALLIC MATERIALS

Includes physical, chemical, and mechanical properties of metals, e.g., corrosion; and metallurgy.

N82-24322*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
TRIBOLOGICAL CHARACTERISTICS OF NITROGEN (N+) IMPLANTED IRON
William R. Jones and John Ferrante 1982 24 p refs Proposed for presentation at the Joint Lubrication Conf., Washington, D.C., 5-7 Oct. 1982; sponsored by the American Society of Lubrication Engineers and ASME
(NASA-TM-82839; E-1207; NAS 1.15:82839) Avail: NTIS HC A02/MF A01 CSCL 11F

The effect of implantation of nitrogen ions (1.5 MeV) on the friction and wear characteristics of pure ion sliding against M-50 steel (unimplanted) was studied in a pin-on-disk sliding friction apparatus. Test conditions included room temperature (25 C), a dry air atmosphere, a load of 1/2 kg (4.9 N), sliding velocities of 0.043 to 0.078 m/sec (15 to 25 rpm), a pure hydrocarbon lubricant (n-hexadecane), or a U.S.P. mineral oil and nitrogen ion implantation doses of 5x10 to the 15th power and 5x10 to the 17th power ions/sq cm. No differences in wear rates were observed in the low dose experiments. In the high dose experiments, small reductions in initial (40 percent) and steady state (20 percent) wear rates were observed for nitrogen implanted iron riders as compared with unimplanted controls. No differences in average friction coefficients were noted for either dose. Auger electron spectroscopy combined with argon ion bombardment revealed a subsurface Gaussian nitrogen distribution with a maximum concentration of 6 atomic percent at a depth of 0.8 microns. Similar analysis within the wear scar of an implanted rider after 20 microns of wear yielded only background nitrogen concentration. No inward migration of nitrogen ions was observed. M.G.

N82-24323*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EFFECT OF OXIDE FILMS ON HYDROGEN PERMEABILITY OF CANDIDATE STIRLING ENGINE HEATER HEAD TUBE ALLOYS
Susan R. Schuon and John A. Misencik 1981 32 p refs Presented at the 110th Ann. Meeting of Am. Inst. of Mining, Met. and Petrol. Engrs., Chicago, 22-26 Feb. 1981
(Contract DE-A101-77CS-51040)
(NASA-TM-82824; E-1176; DOE/NASA/51040-38; NAS 1.15:82824) Avail: NTIS HC A03/MF A01 CSCL 11F

The effect of oxide films developed in situ from CO/CO2 doped hydrogen on high pressure hydrogen permeability at 820 C was studied on N-155, A-286, IN 800, 19-9DL, Nitronic 40, HS-188, and IN 718 tubing in a Stirling materials simulator. The hydrogen permeability decreased with increasing dopant levels of CO or CO2 and corresponding decreases in oxide porosity. Minor reactive alloying elements strongly influenced permeability. At high levels of CO or CO2, a liquid oxide formed on alloys with greater than 50 percent Fe. This caused increased permeability. The oxides formed on the inside tube walls were analyzed and their effective permeabilities were calculated. T.M.

N82-24324*# Failure Analysis Associates, Palo Alto, Calif.
THE INFLUENCE OF MICROSTRUCTURE ON THE RESISTANCE OF LOW STRENGTH FERROUS ALLOYS TO GAS PHASE HYDROGEN DEGRADATION Final Report
Harry F. Wachob May 1981 57 p refs
(Contract NAS2-9901)
(NASA-CR-166334; NAS 1.26:166334; FAA-81-5-2) Avail: NTIS HC A04/MF A01 CSCL 11F

The ferrous microstructure on the near threshold fatigue behavior was determined in air and in 6.9 MPa hydrogen. The fatigue crack growth rate at 1 Hertz and R approximately 0.15 is independent of microstructure and strength level for both an A516-G70 and X-60 linepipe steel at alternating stress intensities (delta K) greater than approximately 15 MP a m1/2. High pressure hydrogen greatly accelerated the fatigue crack growth rate at these delta K's, but did not alter the observed strength or microstructure independences. The fatigue threshold values at one billionth ms were determined for several normalized, and quenched and tempered microstructure in the A516-G70 steel. For delta K < 15 MPa m1/2 both an austenitic grain size dependence and a strength level dependence of the near threshold fatigue behavior were observed. The fatigue threshold value increased with increased austenitic grain size and increased yield strength. In addition, the threshold values decreased in a hydrogen environment, the martensitic microstructures showing the largest decrease, normalized microstructure showing the least.
S.L.

N82-24325*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CORRELATION OF TENSILE AND SHEAR STRENGTHS OF METALS WITH THEIR FRICTION PROPERTIES
Kazuhisa Miyoshi and Donald H. Buckley 1982 23 p refs Proposed for presentation at the Joint Lubrication Conf., Washington, D.C., 5-7 Oct. 1982; sponsored by ASME and the American Society of Lubrication Engineers
(NASA-TM-82828; E-1186; NAS 1.15:82828) Avail: NTIS HC A02/MF A01 CSCL 11F

The relation between the theoretical tensile and the shear strengths and the friction properties of metals in contact with diamond, boron nitride, silicon carbide, manganese-zinc ferrite, and the metals themselves in vacuum was investigated. The relationship between the actual shear strength and the friction properties of the metal was also investigated. An estimate of the theoretical uniaxial tensile strength was obtained in terms of the equilibrium surface energy, interplanar spacing of the planes perpendicular to the tensile axis, and the Young's modulus of elasticity. An estimate of the theoretical shear strength for metals was obtained from the shear modulus, the repeat distance of atoms in the direction of shear of the metal and the interplanar spacing of the shear planes. The coefficient of friction for metals was found to be related to the theoretical tensile, theoretical shear, and actual shear strengths of metals. The higher the strength of the metal, the lower the coefficient of friction. Author

N82-24326*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
A STATUS REVIEW OF NASA'S COSAM (CONSERVATION OF STRATEGIC AEROSPACE MATERIALS) PROGRAM Executive Status Report
Joseph R. Stephens Washington May 1982 46 p refs
(NASA-TM-82852; E-1222; NAS 1.15:82852) Avail: NTIS HC A03/MF A01 CSCL 11F

The use and supply of strategic elements in nickel base superalloys for gas turbine engines are reviewed. Substitution of strategic elements, advanced processing concepts, and the identification of alternate materials are considered. Cobalt, tantalum, columbium, and chromium, the supplies of which are 91-100% imported, are the materials of major concern. J.D.

N82-24327# Japan Atomic Energy Research Inst., Tokyo.
COMPATIBILITY OF HEAT RESISTANT ALLOYS WITH BORON CARBIDE
S. Muraoka and S. Baba Nov. 1980 23 p refs
(DE81-700044; JAERI-M-9185) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

The solid state compatibility of Hastelloy X and Incoloy 800 with boron carbide (B4C) were investigated at 850 - 10500C for periods of 20 - 2000 hrs for potential control rod application for very high temperature gas-cooled reactors. Both alloys were incompatible with nearly stoichiometric B4C or E4C+C (70 wt% carbon) and were less compatible with nearly stoichiometric B4C than with B4C over the temperature range 850 to 10000C. At 10500C for 100 hrs, both alloys reacted with nearly stoichiometric B4C or B4C+C were melt by producing eutectic alloys. It was observed that boron and carbon penetration in the alloy is dominated by the grain boundary penetration with a uniform reaction layer near the surface as a result of volume penetration. In general, Incoloy 800 was more compatible than Hastelloy X. The phases formed on alloys were identified to be Fe2B, Cr2B and Ni2B by X-ray diffraction. DOE

N82-24328# Rensselaer Polytechnic Inst., Troy, N. Y.
HYDROGENASSISTED CRACKING IN HY-130 WELDMENTS Final Technical Report, 1 Jul. 1980 - 31 Jan. 1981
W. F. Savage, E. F. Nippes, and E. I. Husa 23 Dec. 1981 61 p refs
(Contract N00014-75-C-0944; NR Proj. 031-780)
(AD-A111019) Avail: NTIS HC A04/MF A01 CSCL 11/6

The relative susceptibility to hydrogen-assisted cracking of AX-140 welds on HY-130 plate material and on AX-140 all-weld-metal specimens was investigated. Controlled amounts of diffusible hydrogen were introduced into these weldments by using the pulsed-current gas metal arc welding process with additions of hydrogen or moisture to the shielding gas. The critical hydrogen content required for crack initiation and propagation was determined by the augmented strain cracking (ASC) test. Crack initiation and propagation were monitored with acoustic-emission techniques. Although hydrogen-assisted cracking invariably initiated in the fusion zone, it frequently propagated into the heat-affected zone. Crack propagation through the weld metal was not always related to the solidification structure. The critical hydrogen content to initiate cracking in AX-140 welds on HY-130 plate was approximately 1 ppm, whereas in AX-140 welds on AX-140 all-weld-metal the critical hydrogen content was approximately 3 ppm. This difference is cracking susceptibility was ascribed to the difference between the base-metal and the fusion-zone analyses. GRA

N82-24329# Naval Postgraduate School, Monterey, Calif. Dept. of Mechanical Engineering.
A CORRELATION BETWEEN THE HEAT AFFECTED ZONE MICROSTRUCTURE AND THE THERMAL HISTORY DURING WELDING OF HY-130 STEEL M.S. Thesis
Michael Joseph Sorek Sep. 1981 96 p refs
(AD-A111208) Avail: NTIS HC A05/MF A01 CSCL 11/6

A study of microstructure as a function of distance from the fusion line was conducted for an instrumented weld in HY-130 steel plate. Thermocouples were positioned in the plate at various distances from the fusion line and were used to obtain the welding thermal history at these locations. A correlation was then developed between the microstructures observed and the thermal history experienced. Additionally, the tempering of

the heat affected zones of the initial weld passes by subsequent weld passes was calculated and correlated with hardness and microstructural data. Finally, a further study of the metallurgical notch phenomenon postulated by Brucker was undertaken.
Author (GRA)

N82-24330# Naval Research Lab., Washington, D. C.
A COMPARISON OF MICROSTRUCTURAL EFFECTS ON FATIGUE-CRACK INITIATION AND PROPAGATION IN Ti-6Al-4V Final Report
G. R. Yoder, L. A. Cooley, and T. W. Crooker 5 Mar. 1982 18 p refs
(AD-A111610; NRL-MR-4758) Avail: NTIS HC A02/MF A01 CSCL 11/6

Fatigue-crack initiation and propagation studies were conducted on commercial purity (0.20 weight percent interstitial oxygen) Ti-6Al-4V rolled plate, heat treated to produce three differing microstructures. The three heat treatments were an as-received mill anneal (MA), a recrystallization anneal (RA), and a beta anneal (BA). The fatigue-crack propagation results show a distinct ordering of crack growth rate (da/dN) versus stress-intensity range (delta K) curves on the basis of microstructure. The coarse-grained Widmanstatten BA material exhibits the greatest resistance to crack propagation, and the finer-grained MA material offers the least crack propagation resistance. For fatigue-crack initiation, results obtained from blunt-notch WOL-type fracture mechanics specimens reveal a different ordering in relation to microstructure. The MA and RA materials are indistinguishable in their resistance to crack initiation; moreover, their crack initiation resistance is moderately superior to that of the BA material in the low-cycle regime. GRA

N82-24331# Central Research Inst. for Physics, Budapest (Hungary).
A (63)Cu AND (65)Cu NMR STUDY ON AN AMORPHOUS Ni-Cu-P ALLOY
K. Tompa, I. Bakonyi, P. Banki, and L. Takacs Oct. 1980 6 p refs
(KFKI-1980-88) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

The Cu-03 and Cu-65 NMR spectra were recorded on an amorphous Ni Cu P alloy using the points by point spin echo technique, and the spin lattice relaxation times, were measured by the 180 deg pulse spin each and the saturation comb spin echo sequences. The results were compared with the corresponding parameters of the 31 spectrum. The quadrupole broadening is the dominant factor in the NMR spectra of both Cu isotope and the Korringa-type mechanism is responsible for the nuclear spin lattice relaxation. DOE

N82-24332# Israel Atomic Energy Commission, Beersheba.
REACTIONS OF ALIPHATIC FREE RADICALS WITH TRANSITION METAL COMPLEXES Ph.D. Thesis - Ben-Gurion Univ. of the Negev, Feb. 1980
Miriam Freiberg Jul. 1980 105 p refs In HEBREW; ENGLISH summary Submitted for publication
(DE81-700476; NRCN-489) Avail: NTIS (US Sales Only) HC A06/MF A01; DOE Depository Libraries

A pulse radiolytic study of the reactions of copper ions with free aliphatic radicals was carried out. It was found that all the aliphatic radicals studied react with Cu sub (aq)(+) and Cu sub (aq)(2+), forming on unstable compound, with a carbon-copper sigma bond, according to the reaction Mn sub (aq)(n+)+ dot CR1R2R3 yields M-CR1R2R3(n+). It was also found that the rates of formation of the intermediate compounds, their half-lives and their decomposition mechanism depend on the properties of the radical and the cation. Experiments for the determination of the influence of macrocyclic ligands of the Curtis type on the stability of intermediate compounds failed because of insufficient concentrations of these ligands. The processes of ligand hydridization, isomerization and decomposition for the macrocylic complexes Cu(I)L were also studied. These complexes, which are unstable, are formed as a result of the reaction of the stable Cu(II)L complexes with certain free aliphatic radials. DOE

N82-24333# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
INFLUENCE OF LEAD IONS ON THE MACROMORPHOLOGY OF ELECTRODEPOSITED ZINC M.S. Thesis
Tetsuaki Tsuda and Charles W. Tobias Sep. 1981 119 p refs (Contract W-7405-eng-48)
(DE82-002696; LBL-13057) Avail: NTIS HC A06/MF A01

The morphology of zinc as it is electrodeposited from acid solutions demonstrates a remarkable imprint of electrolyte flow conditions. The development of macromorphology of zinc deposits was investigated under galvanostatic conditions on a rotating plantinum disk electrode by use of photomacrography, scanning electron microscopy, electron probe microanalysis and Auger microprobe analysis. Logarithmic spiral markings, which reflect the hydrodynamic flow on a rotating disk, appear in a certain region of current density well below the limiting current density. Morphological observations revealed the major influence of trace lead ions on the amplifications of surface roughness through coalescence and preferred growth of initial protrusions. Results obtained from ultra-pure electrolyte suggest preferred crystal growth towards well-mixed orientation in the concentration field caused by slight differences in crystallization overpotential. A qualitative model involving a coupling mechanism between the evolving surface roughness and instability phenomena in the boundary layer is advanced to explain the formation of spiral patterns. DOE

N82-24334# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Res.
EROSION/CORROSION NEWSLETTER
Alan V. Levy Jun. 1981 31 p refs
(Contract W-7405-eng-48)
(DE81-030538; LBL-Pub-304) Avail: NTIS HC A03/MF A01

Information is presented concerning corrosion-erosion wear testing of ductile metals and brittle ceramiks. The following were studied: two-phase gas flow and two-phase liquid flow; corrosion testing of oil shale retort components; erosion of alloys for coal liquefaction systems; and protective coatings for alloys used in fossil fuel combustion systems. DOE

N82-24335# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
SURFACE STUDIES OF NICKEL Ph.D. Thesis
Cynthia Marie Friend Aug. 1981 128 p refs
(Contract W-7405-eng-48)
(DE82-001753; LBL-13072) Avail: NTIS HC A07/MF A01

The coordination chemistry of a range of molecules of catalytic importance adsorbed on nickel surfaces was investigated. These studies were performed as a function of surface crystallography and composition. Five crystallographic planes were utilized; the three low Miller index Ni(111), Ni(110) and Ni(100), the stepped Ni 9(111) x (111) and the stepped-kinked Ni 7(111) x (310) with carbon, sulfur and oxygen introduced as surface contaminants. Detailed studies of the aromatic hydrocarbons, benzene and toluene, were performed. Thermal desorption spectroscopy and chemical displacement reactions were used in conjunction with isotope exchange reactions to delineate key factors that control C-H bond activation for these molecules adsorbed on nickel surfaces. Reactive studies of the cyclic hydrocarbons, cyclohexane, cyclohexene, 1,3- and 1,4-cyclohexadiene, to form benzene were carried out using the same approach. DOE

N82-24336# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
EVOLUTION OF THE PHONON SPECTRUM AND THE DENSITY OF STATES AT THE FERMI LEVEL NEAR THE MARTENSITIC TRANSFORMATION IN Ni Al, Ti (Ni Co), Cu Zn, Al AND IN Ti ALLOYS Ph.D Thesis - Paris Univ. 6
Daniel Abbe 1981 90 p refs In FRENCH; ENGLISH summary Report will also be announced as translation (ESA-TT-767)
(ONERA-NT-1981-9; ISSN-0078-3781; ESA-TT-767) Avail: NTIS HC A05/MF A01

The electronic structure and the phonon spectrum of four metallic alloy systems were studied at concentrations close to the concentration where the martensitic transformation appears (x sub o). Low temperature specific heat, magnetic susceptibility and, in the case of some alloys, inelastic neutron scattering measurements were made. For the Ni 1+x Al 1-x and Ti (Ni 1-x Co x) systems, the calorimetric data show that as the alloy turns martensitic, the density of states at the Fermi level decreases. Results also show very strong electron-phonon coupling, since

the electronic specific heat coefficient is strongly reinforced in the vicinity of x sub 0. The lattice term is very high, and deviates strongly from the low temperature behavior. Since measurements were not performed on single crystals, these properties could not compare with neutron data for the phonon spectrum. For the Cu Zn Al alloys, an increase of the density of states at the Fermi level can be inferred from magnetic susceptibility measurements. Author (ESA)

N82-24337# National Bureau of Standards, Washington, D.C.
US DEPARTMENT OF COMMERCE PUBLIC WORKSHOP ON CRITICAL MATERIALS NEEDS IN THE AEROSPACE INDUSTRY
John B. Wachtman, Jr., ed. Jul. 1981 700 p refs Workshop held 9-10 Feb. 1981
(PB82-137266; NBSIR-81-2305) Avail: NTIS HC A99/MF A01 CSCL 11F

The materials issues of primary concern to the American aerospace industry and its suppliers; recommendations of the American aerospace industry and its suppliers for Federal action to address these issues. The Department of Commerce should review in detail specific materials over the next few months in order to recommend to most urgently needed programs for Federal action is considered. These topics were addressed within three distinct areas: critical raw materials, critical engineering materials, and substitution, conservation, specialized recycling, and higher performance. The formal views presented to the plenary workshop sessions, the reports of the workshop task forces in each of the three areas, and the written submissions invited in the Federal Register notice of the workshop are presented. GRA

N82-24902# Austrian Research Center, Seibersdorf.
LONG TIME EFFECTS IN RADIATION ENHANCED PERMEATION OF H2 THROUGH STAINLESS STEEL TUBES
G. Schwarzinger and R. Dobrozemsky *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 129-133 refs Sponsored by Fonds zur Foerderung der Wissenschaftlichen Forschung Austria (For primary document see N82-24880 15-70) Avail: NTIS HC A16/MF A01

27 NONMETALLIC MATERIALS

Includes physical, chemical, and mechanical properties of plastics, elastomers, lubricants, polymers, textiles, adhesives, and ceramic materials.

N82-24338* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
PREPARATION OF CROSSLINKED 1,2,4-OXADIAZOLE POLYMER Patent
Robert W. Rosser (San Jose State Univ.), Ibrahim M. Shalhoub (San Jose State Univ.), and Hanoi Kwong, inventors (to NASA) (San Jose State Univ.) Issued 16 Jun. 1981 3 p Filed 30 Apr. 1980 Division of US Patent Appl. SN-028301, filed 9 Apr. 1979 Sponsored by NASA
(NASA-Case-ARC-11253-2; US-Patent-4,273,918; US-Patent-Appl-SN-145284; US-Patent-Appl-SN-028301; US-Patent-Class-528-310; US-Patent-Class-528-328; US-Patent-Class-528-362; US-Patent-Class-528-401; US-Patent-Class-528-422) Avail: US Patent and Trademark Office

New crosslinked 1,2,4-oxadiazole elastomers were prepared by thermally condensing a monomer having the formula H2N(HON)C-R-Q, wherein Q is a triazine ring-forming group such as nitrile or amidine or a mixture of such group with amidoxime, or a mixture of said monomer with R [C(NOH)NH2] sub 2 with R in these formulas standing for a bivalent organic radical. In the monomer charge, the overall proportions of amidoxime groups to triazine ring-forming groups varies depending on the extent of crosslinking desired in the final polymer. M.K.

N82-24339* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
ADJUSTABLE HIGH EMITTANCE GAP FILLER Patent
Daniel B. Leiser (Stanford Univ., Calif.), David A. Stewart, Marnell Smith, Carlos A. Estrella, and Howard E. Goldstein, inventors (to NASA) Issued 29 Dec. 1981 7 p Filed 7 May 1980 Supersedes N80-23454 (18 - 14, p 1822)
(NASA-Case-ARC-11310-1; US-Patent-4,308,309; US-Patent-Appl-SN-147700; US-Patent-Class-428-193; US-Patent-Class-102-289; US-Patent-Class-244-121; US-Patent-Class-244-158A; US-Patent-Class-244-160; US-Patent-Class-428-49; US-Patent-Class-428-192; US-Patent-Class-428-241; US-Patent-Class-428-242; US-Patent-Class-428-245; US-Patent-Class-428-251; US-Patent-Class-428-257; US-Patent-Class-428-260; US-Patent-Class-428-266; US-Patent-Class-428-447; US-Patent-Class-428-448) Avail: US Patent and Trademark Office CSCL 07C

A flexible, adjustable refractory filler is disclosed for filling gaps between ceramic tiles forming the heat shield of a space shuttle vehicle, to protect its aluminum skin during atmospheric reentry. The easily installed and replaced filler consists essentially of a strip of ceramic cloth coated, at least along both its longitudinal edges with a room temperature vulcanizable silicone rubber compound with a high emittance colored pigment. The filler may have one or more layers as the gap width requires, and a rubber compounded with silicon tetraboride as the emittance agent and finely divided borosilicate glass containing about 7.5% B2O3 as high temperature binder. The filler cloth strip or tape is cut to proper width and length, inserted into the gap, and fastened with previously applied drops of silicone rubber adhesive.
Official Gazette of the U.S. Patent and Trademark Office

N82-24340* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
METHOD OF BONDING PLASTICIZED ELASTOMER TO METAL AND ARTICLES PRODUCED THEREBY Patent
William T. White, Johnny M. Clemons, and Frank E. Ledbetter, III, inventors (to NASA) Issued 27 Apr. 1982 3 p Filed 19 Dec. 1980 Supersedes N81-16238 (19 - 07, p 0886)
(NASA-Case-MFS-25181-1; US-Patent-4,327,150; US-Patent-Appl-SN-218585; US-Patent-Class-428-332; US-Patent-Class-156-315; US-Patent-Class-156-338; US-Patent-Class-428-339; US-Patent-Class-428-462; US-Patent-Class-428-466; US-Patent-Class-428-493) Avail: US Patent and Trademark Office CSCL 11I

Plasticized elastomer was securely bonded to a metal surface by interposing between the adhesive-coated metal surface and the elastomer sheet of material obtained by combining adhesive with a portion of the elastomer that was treated to remove plasticizers therefrom and heating the assembly in a mold under pressure. The sheet material is made up by dissolving a portion of the plasticized elastomer in an organic solvent, casting the solution, exposing it to a vacuum to remove the solvent and plasticizers, dissolving the deplasticized material in liquid adhesive and casting and drying the resulting liquid. Author

N82-24341# National Physical Lab., Teddington (England). Div. of Materials Applications.
LONG TERM STRENGTH OF GLASS REINFORCED PLASTICS IN DILUTE SULPHURIC ACID
J. Aveston and J. M. Sillwood Feb. 1982 26 p refs
(NPL-DMA(A)39; NPL-MAT(8)2; ISSN-0143-7313) Avail: Issuing Activity

Data on the long-term strength of unidirectional and crossply glass reinforced polyester (GRP) resin under static and cyclic loading is given. Conventional E glass reinforcement, and an alkali resistant glass developed for cement were used. Direct observation of crack growth rates was used to predict failure times under both static and fatigue loading. The cement reinforcement GRP is inert to dilute acid and appears to have an almost indefinite life. The E glass GRP rapidly falls in strength and fails by brittle crack propagation. Author (ESA)

N82-24342*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PMR POLYIMIDES-REVIEW AND UPDATE
Tito T. Serafini, Peter Delvigs, and William B. Alston 1982 19 p refs Presented at the 27th Natl. SAMPE Symp. and Exhibition, San Diego, Calif., 4-6 May 1982

(NASA-TM-82821; E-1111; NAS 1.15:82821; AVRADCOM-TR-82-C-3) Avail: NTIS HC A02/MF A01 CSCL 11G

Fiber reinforced PMR polyimides are finding increased acceptance as engineering materials for high performance structural applications. Prepreg materials based on this novel class of highly processable, high temperature resistant polyimides are commercially available and the PMR concept is used by other investigators. The current status of first and second generation PMR polyimides were reviewed. Emphasis is given to the chemistry, processing and applications of the first generation material known as PMR-15. T.M.

N82-24343*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

TRIBOLOGICAL PROPERTIES OF SINTERED POLYCRYSTALLINE AND SINGLE CRYSTAL SILICON CARBIDE

Kazuhisa Miyoshi, Donald H. Buckley, and M. Srinivasan (Carborundum) 1982 28 p refs Presented at the 84th Ann. Meeting of the Am. Ceram. Soc., Cincinnati, 2-5 May 1982 (NASA-TM-82829; E-1194; NAS 1.15:82829) Avail: NTIS HC A03/MF A01 CSCL 11G

Tribological studies and X-ray photoelectron spectroscopy analyses were conducted with sintered polycrystalline and single crystal silicon carbide surfaces in sliding contact with iron at various temperatures to 1500 C in a vacuum of 30 nPa. The results indicate that there is a significant temperature influence on both the friction properties and the surface chemistry of silicon carbide. The main contaminants on the as received sintered polycrystalline silicon carbide surfaces are adsorbed carbon, oxygen, graphite, and silicon dioxide. The surface revealed a low coefficient of friction. This is due to the presence of the graphite on the surface. At temperatures of 400 to 600 C graphite and copious amount of silicon dioxide were observed on the polycrystalline silicon carbide surface in addition to silicon carbide. At 800 C, the amount of the silicon dioxide decreased rapidly and the silicon carbide type silicon and carbon peaks were at a maximum intensity in the XPS spectra. The coefficients of friction were high in the temperature range 400 to 800 C. Small amounts of carbon and oxygen contaminants were observed on the as received single crystal silicon carbide surface below 250 C. Silicon carbide type silicon and carbon peaks were seen on the silicon carbide in addition to very small amount of graphite and silicon dioxide at temperatures of 450 to 800 C. S.L.

N82-24344*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

HEAT SEALABLE, FLAME AND ABRASION RESISTANT COATED FABRIC Patent Application

Richard P. Tschirch (Little (Arthur D.), Inc., Cambridge, Mass.) and Kenneth R. Sidman, inventors (to NASA) (Little (Arthur D.), Inc., Cambridge, Mass.) Filed 6 Mar. 1981 17 p Sponsored by NASA

(NASA-Case-MSC-18382-2; US-Patent-Appl-SN-241155) HC A02/MF A01 CSCL 11E

A flexible, lightweight, air impermeable coated fabric is discussed which has excellent resistance to flame and abrasion. Heat or dielectric sealing is used. The coating is thermoplastic polyurethane compounded with flame retardant fillers. NASA

N82-24345*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

INDUCTION HEATING GUN Patent Application

John D. Buckley and Robert J. Swaim, inventors (to NASA) Filed 22 Dec. 1981 14 p

(NASA-Case-LAR-12540-2; US-Patent-Appl-SN-333536) Avail: NTIS HC A02/MF A01 CSCL 11I

A device for inductively heating and fusing thermoplastics is discussed. It includes an alternating current passing through a tank circuit, the inductor member of the tank circuit being wrapped around a curved pole piece of a ferromagnetic material. The magnetic flux arising within the inductor coil member flows to the ends of the pole piece and into a screen placed between the materials to be joined. The flux induces a current in the screen, and heat is generated to melt the thermoplastics together. Because only 30 to 150 watts of power are passed through the tank circuit, a wire which will remain cool under operational wattage may be selected, making air or fluid cooling unnecessary. NASA

N82-24346# Central Research Inst. for Physics, Budapest (Hungary).

CHEMICAL AND TOPOLOGICAL SHORT-RANGE ORDER IN METALLIC GLASSES

I. Vincze, A. S. Schaafsma, J. VanderWoude, T. Kemeny, and A. Lovas Oct. 1980 7 p refs

(KFKI-1980-90) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

Moessbauer spectroscopy was applied to the study of chemical short range order in (Fe,Ni)B metallic glasses. It was found that the atomic arrangement in melt quenched glasses closely resembles that of the crystalline counterparts (Fe3B is tetragonal, Ni3B is orthorombic). The distribution of transition metal atoms is not random at high Ni concentrations: Ni atoms prefer a neighborhood with a higher boron coordination. DOE

N82-24347# Central Research Inst. for Physics, Budapest (Hungary).

CRYSTALLIZATION PRODUCTS OF Fe-B-Si BASED METALLIC GLASSES

T. Kemeny, A. Lovas, I. Vincze, H. A. Davies, and I. W. Donald Oct. 1980 8 p refs

(KFKI-1980-103) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

The crystallization of FeBSi metallic glasses was investigated by calorimetry and Moessbauer spectroscopy. On the basis of Moessbauer spectra the crystallization products were identified and the composition dependence of the crystallization process is discussed. DOE

N82-24348# Central Research Inst. for Physics, Budapest (Hungary).

SOME IRON-BASED METALLIC GLASSES STUDIED BY POSITRON ANNIHILATION

Zs. Kajcsos and G. Brauer Oct. 1980 7 p refs

(KFKI-1980-74) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

The Fe40Ni40B16P4, Fe40Ni40P14B6, Fe80B20, Fe32-Ni36Cr14P12B6 iron-based glassy systems were investigated by positron annihilation methods. Regarding the parameters measured, a pronounced difference in the values referring to amorphous and crystalline phases, respectively, was found for Fe80B20 only. The presence of trapping centre in the amorphous state of Fe40Ni30P14B6 is assumed on the basis of measurements studying the dependence of the annihilation parameters on the heat-treating temperature as compared with results for well-annealed and deformed crystalline pure metals. DOE

N82-24349# International Atomic Energy Agency, Vienna (Austria).

APPLICATION OF MOESSBAUER SPECTROSCOPY IN STUDIES OF THERMAL FATIGUE OF CERAMIC MATERIALS. PART OF A COORDINATED PROGRAMME ON DEVELOPMENT OF METHODS FOR THE APPLICATION OF MOESSBAUER SPECTROSCOPY IN MINERALOGY, SOIL SCIENCES AND CERAMICS Final Report, 15 Apr. 1977 - 31 Oct. 1980

N-H. J. Gangas (Ioannina Univ., Greece) Oct. 1980 15 p refs

(IAEA-R-1958-F) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

Moessbauer measurements were carried out on powder samples of pseudobrookite (Fe2TiO5) which is known to exhibit extensive microcracking due to its highly anisotropic thermal expansion. The samples were subjected to temperature cycling treatment either at high (30 to 450 C) or low (-130 to 120 C) temperature range. It was observed that the crystal lattice vibrations changed in response to the thermal fatigue treatment applied. Measurements of isomer shift and Moessbauer spectral areas allows determination of the characteristic Debye temperature which depends on the type of temperature treatment used. The findings are in qualitative agreement with the existence of a critical grain size for the microcracking of Fe2TiO5 as found in elastic modules and flexural strength measurements. DOE

N82-24350# International Atomic Energy Agency, Vienna (Austria).
MOESSBAUER SPECTROSCOPY STUDY ON THE EFFECT OF INFRARED AND GAMMA RADIATION ON THE STRUCTURE OF MINERALS. PART OF COORDINATED PROGRAMME ON DEVELOPMENT OF METHODS FOR APPLICATION OF MOESSBAUER SPECTROSCOPY IN MINERALOGY, SOIL SCIENCES AND THE STUDY OF CERAMICS Final Report, 1 Apr. 1978 - 30 Sep. 1981
H. Pollak (National Univ. of Zaire) Aug. 1981 3 p
(DE81-700780; IAEA-R-2174-F) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

A number of fundamental and applied problems were studied by Moessbauer spectroscopy. The observation of Moessbauer spectra in iron silicate deerite with respect to the structure of this mineral was interpreted by charge transfer between iron ions, and correlated with thermally activated electron delocalisation. The studies of local coals showed the suitability of Moessbauer spectroscopy in control of the desulfurization process. A simple method to use Moessbauer measurement to determine the obstructions in water pipes was developed. DOE

N82-25115 SRI International Corp., Menlo Park, Calif.
A NEW POLYMERIZATION TECHNIQUE FOR PREPARING LOW MOLECULAR WEIGHT POLYETHER GLYCOLS
G. E. Manser, J. Guimont, and D. L. Ross *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 1 May 1981 p 29-37 refs (For primary document see N82-25112 15-99)
(Contract N00014-79-C-0525)
Copyright. Avail: NTIS HC $60.50/MF $60.50 CSCL 07/4

N82-25117 Naval Weapons Center, China Lake, Calif. Research Dept.
KINETICS OF GAP POLYMERIZATION
M. P. Nadler, R. Reed, Jr., and J. Doyle *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 1 May 1981 p 51-61 refs (For primary document see N82-25112 15-99)
Copyright. Avail: NTIS HC $60.50/MF $60.50 CSCL 07/4

N82-25101*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
EVALUATION OF WAVEGUIDE COATING MATERIALS
W. C. J. Chen and B. W. Baker *In its* The Telecommun. and Data Acquisition Rept. 15 Apr. 1982 p 68-71 refs (For primary document see N82-25092 15-99)
Avail: NTIS HC A09/MF A01 CSCL 11G

28 PROPELLANTS AND FUELS

Includes rocket propellants, igniters, and oxidizers, storage and handling; and aircraft fuels.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power,* and *44 Energy Production and Conversion.*

N82-24351# Committee on Energy and Commerce (U. S. House).
FOSSIL AND SYNTHETIC FUELS MISCELLANEOUS, PART 1
Washington GPO 1981 213 p refs Hearings on H.R. 2166 before the Subcomm. on Fossil and Synthetic Fuels of the Comm. on Energy and Com., 97th Congr., 1st Sess., 26 Feb. 1981
(GPO-84-010) Avail: Subcommittee on Fossil and Synthetic Fuels

The limited antitrust defense available under the Energy Policy and Conservation Act to domestic oil companies participating in an international energy program is discussed. The extension of this antitrust protection beyond March 15, 1982 is considered. An authorization request concerning safety measures to be taken with regard to liquefied natural gas pipelines is discussed. Also discussed is gasohol usage, particularly in government owned motor vehicles. R.J.F.

N82-24352# Committee on Science and Technology (U. S. House).
DIRECT COMBUSTION OF COAL
Washington GPO 1982 128 p refs Hearing before the Subcomm. on Energy Develop. and Appl. of the Comm. on Sci. and Technol., 97th Congr., 1st Sess., No. 69, 10 Dec. 1981
(GPO-89-628) Avail: Subcommittee on Energy Development and Applications

The utilization of coal through direct combustion is discussed. The environmental problems associated with coal use and the work being done to alleviate a number of the problems are discussed. Fluidized bed processors are described. Future domestic energy policy is discussed. R.J.F.

N82-24353*# Aerojet Liquid Rocket Co., Sacramento, Calif.
TESTING OF FUEL/OXIDIZER-RICH, HIGH-PRESSURE PREBURNERS Final Report
B. R. Lawver May 1982 253 p refs
(Contract NAS3-22647)
(NASA-CR-165609; NAS 1.26:165609) Avail: NTIS HC A12/MF A01 CSCL 21I

Results of an evaluation of high pressure combustion of fuel rich and oxidizer rich LOX/RP-1 propellants using 4.0 inch diameter prototype preburner injectors and chambers are presented. Testing covered a pressure range from 8.9 to 17.5 MN/square meters (1292 to 2540 psia). Fuel rich mixture ratios ranged from 0.238 to 0.367; oxidizer rich mixture ratios ranged from 27.2 to 47.5. Performance, gas temperature uniformity, and stability data for two fuel rich and two ozidizer rich preburner injectors are presented for a conventional like-on-like (LOL) design and a platelet design injector. Kinetically limited combustion is shown by the excellent agreement of measured fuel rich gas composition and C performance data with kinetic model predictions. The oxidizer rich test results support previous equilibrium combustion predictions. Author

N82-24354# Southwest Research Inst., San Antonio, Tex. Army Fuels and Lubricants Research Lab.
A FIELD MONITOR FOR THE STABILITY AND CLEANLINESS OF DISTILLATE FUEL Interim Report, Oct. 1978 - Sep. 1981
S. R. Westbrook, L. L. Stavicha, J. G. Barbee, and J. V. Mengenhauser (Army Mobility Equipment Research and Development Command, Ft. Belvoir, Va.) Dec. 1981 56 p refs
(Contracts DAAK70-78-C-0001; DAAK70-80-C-0001; DA Proj. 1L7-62733-AH-20)
(AD-A110694; AFLRL-137) Avail: NTIS HC A04/MF A01 CSCL 14/2

This report details the development of a portable device to measure the cleanliness and stability of diesel fuels in both bulk and vehicle fuel cell storage. Both an initial laboratory prototype and a portable field unit are discussed. The monitor evaluates the cleanliness of the fuel by first filtering the fuel and then determining the amount of particulates on the filters using a contaminated filter measuring device. The filters are rated by measuring the amount of light which passes through the filters to estimate the amount of particulates based on a calibration chart. A measure of the stability of the fuel is obtained by aging a sample of the fuel at 150 C for 1.5 hours and determining the amount of sediment formed. Improvements to the diesel fuel quality monitor have been identified and are being investigated. A field test program to demonstrate monitor utility/effectiveness is planned for initiation in late 1981. In addition, a commercially available portable unit to measure particulate contamination is described and compared to the Army field test unit. GRA

N82-24355# Southwest Research Inst., San Antonio, Tex. Energy Systems Research Div.
IMPACT STUDY OF SYNTHETIC AND ALTERNATIVE FUEL USAGE IN ARMY AIRCRAFT PROPULSION SYSTEMS Final Report, Oct. 1980 - Jun. 1981
C. A. Moses and M. I. Valtierra Jul. 1981 166 p refs Sponsored in part by the Army Mobility Research and Development Command
(Contract N00140-80-C-2269)
(AD-A111046; SwRI-MED134) Avail: NTIS HC A08/MF A01 CSCL 21/4

The U.S. Army is concerned about the quality of future aircraft fuels and their compatibility with current engines and aircraft fuel systems. This impact study of synthetic and alternate fuel usage on Army aircraft propulsion and fuel systems addresses

four technical areas: (1) The fuel scenario for Army aviation gas turbine fuels; (2) The effects of initial properties or the performance and durability of engine and fuel system components; (3) The identification of engines and fuel system components used in Army aircraft and their interface with the fuel; and (4) A review of qualification and certification procedures. Author (GRA)

N82-24356# Daniel Construction Co., Greenville, S.C.
FEASIBILITY STUDY FOR PRODUCTION OF ANHYDROUS ALCOHOL FROM CORN
Dec. 1980 87 p refs Prepared for Missouri Farmers Association, Columbia
(Contract DE-FG01-80RA-50350)
(DE82-000273; DOE/RA-50350/T1) Avail: NTIS HC A05/MF A01

The feasibility of establishing a facility to produce fuel grade alcohol from corn to be located within an existing soybean processing plant was studied. The alcohol producing industries, technical literature, various available process technologies, and industry consultants were surveyed. A process consisting of dry milling corn, continuous cooking, batch fermentation and azeotropic distillation was selected as the most suitable technique for the venture. It was determined that a production rate of 6288 bushels of corn per day yielding 5,200,000 gallons per year of fuel grade ethanol plus the capability to upgrade an additional 500,000 gallons per year of low grade alcohol from off-site production facilities was the best design for the space and facilities available within the existing soybean plant while economically utilizing existing buildings and plant area to the best advantage. A factored estimate of expected capital costs for the gasohol demonstration plant was made based on surveys of the plant site and furnished plant drawings, approximate prices for major items of process equipment, and estimated construction and erection costs. DOE

N82-24357# Los Alamos Scientific Lab., N. Mex.
ATTEMPT TO IDENTIFY AN EXPLOSIVE AFTER HIGHLY CONFINED DETONATION
G. W. Taylor, R. A. Hildner, M. J. Urizar, R. D. Loughran, M. P. Neary, G. W. Taylor, M. L. Clancy, and T. L. McKinney Sep. 1981 11 p
(Contract W-7405-eng-36)
(DE82-002644; LA-8965-MS) Avail: NTIS HC A02/MF A01

Experiments were performed to determine whether an explosive composition can be ascertained from the direct sampling and analysis of the gases and residues left after a highly confined detonation in air. The explosives used in this study were PBX 9501, PBX 9502, and TNT, which were doped with fluorescenin dye. Charges were fired unconfined, partially confined, and fully confined in lead and in stainless steel. Residues were taken from particle filters and from a polyethylene sheet placed in the vicinity of the detonation. Residues were analyzed by electron spectroscopy for chemical analysis (ESCA) and spectrophotometrically. Gases were analyzed by mass spectrometry. The results of this study show that no gases or residues that are indicative of the explosive detonated survive the explosion. DOE

N82-24358# Los Alamos Scientific Lab., N. Mex.
EXPLO: EXPLOSIVES THERMAL ANALYSIS COMPUTER CODE
D. L. Jaeger Sep. 1981 40 p refs
(Contract W-7405-eng-36)
(DE82-002645; LA-8949-MS-Rev) Avail: NTIS HC A03/MF A01

The finite difference method is used to calculate temperature fields and times initiation for explosive materials. The code is one dimensional and is programmed for Cartesian, cylindrical, and spherical coordinates. Temperature-dependent properties, phase changes, and multiple heat source terms are allowed. Multiple source terms use Nthorder Arrhenius kinetics for each material component. Temperature, flux, convection, or radiation boundary conditions may be employed. Internal convection is considered for materials that undergo a solid-liquid phase change. The Crank-Nicholson implicit solution method, which allows large time steps and short running time, is used. DOE

N82-24359# Battelle Pacific Northwest Labs., Richland, Wash.
PRELIMINARY EVALUATION OF ALTERNATIVE ETHANOL/WATER SEPARATION PROCESSES
D. E. Eakin, J. M. Donovan, G. R. Cysewski, S. E. Petty, and J. V. Maxham May 1981 24 p refs
(Contract DE-AC06-76RL-01830)
(DE82-001596; PNL-3823) Avail: NTIS HC A02/MF A01

Preliminary evaluation indicates that separation of ethanol and water can be accomplished with less energy than is now needed in conventional distillation processes. The state of development for these methods varies from laboratory investigation to commercially available processes. The processes investigated were categorized by type of separation depending on their ability to achieve varying degrees of ethanol/water separation. The following methods were investigated: ethanol extraction with CO2 (the A.D. Little process); solvent extracton of ethanol; vacuum distillation; vapor recompression distillation; dehydration with fermentable grains; low temperature blending with gasoline; molecular sieve adsorption; and reverse osmosis. DOE

N82-24360# Ames Lab., Iowa.
ETHANOL PURIFICATION BY ADSORPTION Technical Quarterly Progress Report, 1 Jan. - 31 Mar. 1981
C. D. Chriswell, H. R. Burkholder, and R. W. Fisher Aug. 1981 26 p refs
(Contract W-7405-eng-82)
(DE82-003135; IS-4779) Avail: NTIS HC A03/MF A01

The ethanol sorption process is based on a unique hydrophobic molecular sieve which can collect the alcohol from dilute solutions of fermented starches, sugars, or other renewable materials. Because the separation technique utilizes sorption rather than distillation, the amount of energy and the cost of facilities required to produce absolute or near absolute ethanol can be reduced. The alcohol is subsequently removed from the molecular sieve by an energy efficient process. In this report, the use of microwave energy and of a variety of gases to strip the alcohol from the column is described. Studies on the properties of the silica based molecular sieve include description of porosity, capacity, and the effect of different binders. DOE

N82-25118 Bell Aerospace Co., Buffalo, N. Y. Propulsion and Energy Systems Dept.
THE EFFECTS OF LONG TERM SUBMARINE DEPLOYMENT ON SAFE STORAGE AND RELIABILITY OF LIQUID POST BOOST SYSTEMS
L. M. Usiak *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 1 May 1981 p 63-81 refs (For primary document see N82-25112 15-99)
Copyright. Avail: NTIS HC $60.50/MF $60.50 CSCL 21/9

N82-25120 Bell Aerospace Co., Buffalo, N. Y. Textron Div.
MX STAGE 4 PROPELLANT STORAGE ASSEMBLY
A. J. Friona and R. Wood (Arde, Inc., Mahwah, N.J.) *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 1 May 1981 p 97-111 (For primary document see N82-25112 15-99)
Copyright. Avail: NTIS HC $60.50/MF $60.50 CSCL 21/8

N82-25128 Hercules, Inc., Cumberland, Md. Ballistics Lab.
MECHANISM OF THERMAL STABILIZATION OF NITRATE ESTER PROPELLANTS
P. A. Silver, J. W. Morton, K. O. Hartman, and R. Baczuk *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 1 May 1981 p 287-306 ref (For primary document see N82-25112 15-99)
(Contract N00024-80-C-5322)
Copyright. Avail: NTIS HC $60.50/MF $60.50 CSCL 21/9

N82-25132 Universal Propulsion Co., Phoenix, Ariz.
HIGH DENSITY IMPULSE PROPELLANTS
H. J. McSpadden *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 1 May 1981 p 357-374 refs (For primary document see N82-25112 15-99)
Copyright. Avail: NTIS HC $60.50/MF $60.50 CSCL 21/9

N82-25133 Hercules, Inc., Cumberland, Md. Ballistics Lab.
HIGH PERFORMANCE NON-EMBRITTLING DOUBLE-BASE PROPELLANTS
K. O. Hartmen and P. A. Silver *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 1 May 1981 p 375-398 refs (For

primary document see N82-25112 15-99)
Copyright. Avail: NTIS HC $60.50/MF $60.50 CSCL 21/9

N82-25134 United Technologies Corp., Sunnyvale, Calif. Chemical Systems Div.
SOME NEW ALIPHATIC POLYAZIDES DERIVED FROM PENTAERYTHRITOL
W. S. Anderson and H. J. Hyer *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 1 May 1981 p 387-398 refs (For primary document see N82-25112 15-99)
Copyright. Avail: NTIS HC $60.50/MF $60.50 CSCL 21/9

N82-25135 Tally Industries, Inc., Mesa, Ariz.
DECOMPOSITION OF TETRAZOLES
Indu B. Mishra *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 1 May 1981 p 399-406 refs (For primary document see N82-25112 15-99)
Copyright. Avail: NTIS HC $60.50/MF $60.50 CSCL 21/9

N82-25136 Hercules, Inc., Magna, Utah.
XLDB BINDER CATALYSIS STUDIES
L. W. Haas and J. Sinclair (Thiokol Corp., Brigham City, Utah) *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 1 May 1981 p 407-428 refs (For primary document see N82-25112 15-99)
(Contract N00030-81-C-0081)
Copyright. Avail: NTIS HC $60.50/MF $60.50 CSCL 21/9

N82-25137 Olin Corp., Marion, Ill. Technical Systems Operation Dept.
LOW ENERGY PROPELLANT DEVELOPMENT
I. L. Markovitch and Melanie A. Krason *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 1 May 1981 p 429-445 (For primary document see N82-25112 15-99)
Copyright. Avail: NTIS HC $60.50/MF $60.50 CSCL 21/9

N82-25138 Naval Ordnance Station, Indian Head, Md.
A LOW RATE CTBN PROPELLANT
P. P. Ostrowski, C. Gotzmer, and L. K. Asaoka *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 1 May 1981 p 447-461 refs Prepared in cooperation with Naval Surface Weapons Center, White Oak, Md. (For primary document see N82-25112 15-99)
Copyright. Avail: NTIS HC $60.50/MF $60.50 CSCL 21/9

N82-25139 Atlantic Research Corp., Gainesville, Va.
DESIRABILITY ANALYSIS: A TECHNIQUE FOR GAS GENERANT SCREENING
Phillip H. Graham *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 1 May 1981 p 463-471 refs (For primary document see N82-25112 15-99)
(Contract N00123-77-C-1707)
Copyright. Avail: NTIS HC $60.50/MF $60.50 CSCL 21/9

N82-25157# Marquardt Corp., Van Nuys, Calif.
HYDRAZINE SPACE HAZARD INVESTIGATION
D. G. Phillips *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 2 May 1981 p 141-157 Sponsored by RCA (For primary document see N82-25149 15-99)
Avail: NTIS HC $60.50/MF $60.50 CSCL 21/9

N82-25167# California Univ., Livermore. Lawrence Livermore Lab.
ADDITIVE EROSION REDUCTION INFLUENCES IN THE TURBULENT BOUNDARY LAYER
A. C. Buckingham *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 2 May 1981 p 325-340 refs Sponsored in part by Army (For primary document see N82-25149 15-99)
(Contract W-7405-eng-48)
Avail: NTIS HC $60.50/MF $60.50 CSCL 21/9

N82-25168# Ballistic Research Labs., Aberdeen Proving Ground, Md.
RELATIVE EROSIVITY OF NITRAMINE, TRIPLE BASE, AND DOUBLE BASE PROPELLANTS
R. P. Kaste, I. C. Stobie, J. R. Ward, and B. D. Bensinger *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 2 May 1981 p 341-358 refs (For primary document see N82-25149 15-99)
Avail: NTIS HC $60.50/MF $60.50 CSCL 21/9

N82-25169# Ballistic Research Labs., Aberdeen Proving Ground, Md.
EROSIVITY OF LOVA PROPELLANTS
J. R. Ward, T. L. Brosseau, R. P. Kaste, I. C. Stobie, and B. D. Bensinger *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 2 May 1981 p 359-378 refs (For primary document see N82-25149 15-99)
Avail: NTIS HC $60.50/MF $60.50 CSCL 21/9

31 ENGINEERING (GENERAL)

Includes vacuum technology; control engineering; display engineering; and cryogenics.

N82-24361*# Ohio State Univ., Columbus.
THE ORTHOGONAL IN-SITU MACHINING OF SINGLE AND POLYCRYSTALLINE ALUMINUM AND COPPER, VOLUME 1 Ph.D. Thesis Final Report
Paul H. Cohen May 1982 203 p refs
(Grant NsG-3164)
(NASA-CR-168929; NAS 1.26:168929) Avail: NTIS HC A10/MF A01 CSCL 13H

Metal cutting is a unique deformation process characterized by large strains, exceptionally high strain rates and few constraints to the deformation. These factors, along with the difficulty of directly measuring the shear angle, make chip formation difficult to model and understand. One technique for skirting the difficulty of post mortem chip measurement is to perform a cutting experiment dynamically in a scanning electron microscope. The performance of the in-situ experiment with full instrumentation allows for component force measurement, orientation measurement (on a round single crystal disk) and a timing device, all superimposed below the deformation on the TV monitor and recorded for future viewing. This allows the sher angle to be directly measured for the screen along with the other needed information. S.L.

N82-24362# European Space Agency, Paris (France).
SECOND ESA PRODUCT ASSURANCE SYMPOSIUM
W. R. Burke, comp. Jan. 1982 239 p refs Proc. held at Noordwijk, Netherlands, 10-12 Nov. 1981
(ESA-SP-163; ISSN-0379-6566) Avail: NTIS HC A11/MF A01; ESA, Paris FF 140 Member States, AU, CN and NO (+20% others)

Developments in product assurance in ESA, NASA, and the Chinese, Japanese, and Indian space programs were discussed. Contractors' experience was summarized and quality control and recent technologies, including integrated optical devices, were treated. Microprocessor and software assurance techniques were reviewed. The problems of assurance management and manned space flight were also covered. For individual titles, see N82-24363 through N82-24389.

N82-24363# European Space Research and Technology Center, Noordwijk (Netherlands).
THE SPACE TECHNOLOGY DEMAND ON MATERIALS AND PROCESSES
J. Dauphin *In* ESA 2nd ESA Prod. Assurance Symp. Jan. 1982 p 3-11 refs (For primary document see N82-24362 15-31)
Avail: NTIS HC A22/MF A01; ESA, Paris FF 140 Member States, AU, CN and NO (+20% others)

Space technologies which entail materials or process problems, such as clean satellites, thermal control materials with electrical conductivity, space stations and reusable hardware are reviewed. The statistical approaches to selection used are jeopardized by small production volumes, while the analogy methods are limited by experience. Commercially available materials are extensively used in order to cut development costs, e.g., solar panel adhesives are obtained by cleaning commercial silicones by molecular distillation. The long-life and reusable spacecraft requirements, e.g., for very thin laminates, which cannot be met by commercial products are discussed. Space agencies

either meet needs themselves (NASA makes white conductive paint) or they develop solutions in partnership with manufacturers. Author (ESA)

N82-24364# European Space Research and Technology Center, Noordwijk (Netherlands).

THE ESA PRODUCT ASSURANCE SPECIFICATION SYSTEM **c38**

A. J. S. Capella and M. vonHoegen *In* ESA 2nd ESA Prod. Assurance Symp. Jan. 1982 p 13-20 (For primary document see N82-24362 15-31)

Avail: NTIS HC A11/MF A01; ESA, Paris FF 120 Member States, AU, CN and NO (+20% others)

The ESA PSS-01 documentation series is introduced. Specifications are rewritten or reidentified to fit a three-level structure which provides for the separation of basic requirements and their expansion into groups of specifications, covering a major technology or discipline. Specifications of lower level importance can be added to each group and groups can be created for new technologies and disciplines with only minor modification to existing specifications. Author (ESA)

N82-24365# European Space Research and Technology Center, Noordwijk (Netherlands).

PRODUCT ASSURANCE REQUIREMENTS FOR SPACELAB EXPERIMENTS **c38**

P. DiPalermo *In* ESA 2nd ESA Prod. Assurance Symp. Jan. 1982 p 21-26 (For primary document see N82-24362 15-31)

Avail: NTIS HC A11/MF A01; ESA, Paris FF 140 Member States, AU, CN and NO (+20% others)

The quality assurance of Spacelab experiments is discussed. Difficulties arose because many scientists involved had no experience of space reliability and quality criteria (early experiments were broken in transit from laboratories). Also, economic independence from ESA made imposing specifications difficult. Quality control is achieved by imposing strict safety and interface requirements. Author (ESA)

N82-24366# Centre National d'Etudes Spatiales, Toulouse (France).

FUTURE TRENDS OF ARIANE PROJECT AND CNES QUALITY ASSURANCE **c38**

Pierre Quemarec *In* ESA 2nd Prod. Assurance Symp. Jan. 1982 p 27-30 refs (For primary document see N82-24362 15-31)

Avail: NTIS HC A11/MF A01; ESA, Paris FF 140 Member States, AU, CN and NO (+20% others)

A quality assurance approach which standardizes manufacturer and customer procedures is outlined. Terminology, methodology and formats (e.g., control documents) are harmonized. Experience with Ariane and other CNES projects (SPOT, Telecom) shows that this approach is needed to overcome difficulties which arise, e.g., when one project includes reliability in quality specifications, a second includes configurations, but not reliability, and both use the same manufacturer. Author (ESA)

N82-24367# European Space Agency, Paris (France). Contracts Dept.

PRODUCT LIABILITY: PRESENT STATUS, TRENDS AND PREVENTIVE MEASURES **c38**

W. Thoma *In its* 2nd ESA Prod. Assurance Symp. Jan. 1982 p 31-38 (For primary document see N82-24362 15-31)

Avail: NTIS HC A11/MF A01; ESA, Paris FF 140 Member States, AU, CN and NO (+20% others)

Legal aspects of product failure are discussed. Liability can either be contractural or tort. For tort liability, an injury caused by a defect, arising from the defendant's negligence, must be proved. The trend towards stricter consumer legislation is expected to influence contracts for space products. If a communication satellite crashes onto a crowded beach there is no product liability since there is no user injury, but the broadcasting company can sue for interruption of services. Space shuttles illustrate the need for careful contract preparation, since hardware is subject to repair and maintenance, and the risk to life increases with the increasing number of people working in space, e.g., on Spacelab. Author (ESA)

N82-24368# Indian Space Research Organization, Bangalore. Satellite Centre.

PRODUCT ASSURANCE POLICY AND MANAGEMENT APPLIED TO INDIAN SPACE PROGRAMS **c38**

K. R. Ramgopal *In* ESA 2nd ESA Prod. Assurance Symp. Jan. 1982 p 37-42 (For primary document see N82-24362 15-31)

Avail: NTIS HC A11/MF A01; ESA, Paris FF 140 Member States, AU, CN and NO (+20% others)

The role of the product assurance department (PAD) in Indian space programs is outlined. The PAD procures and qualifies component parts; estimates and analyzes satellite reliability; quality controls spacecraft hardware manufacture and assembly; and tests and evaluates spacecraft hardware. The PAD is involved in design reviews and launch operations, advising on configuration, parts, materials and processes. The Indian policy of planning, designing, and building in-house means that if they have to buy from outside, the PAD cooperates in integration programs, and programs for developing the item for future projects. Author (ESA)

N82-24369# National Space Development Agency, Tokyo (Japan).

QUALITY ASSURANCE ON JAPANESE SPACE PROGRAMMES **c38**

T. Makino and M. Shimodaira *In* ESA 2nd ESA Prod. Assurance Symp. Jan. 1982 p 43-48 (For primary document see N82-24362 15-31)

Avail: NTIS HC A11/MF A01; ESA, Paris FF 140 Member States, AU, CN and NO (+20% others)

Quality assurance is discussed in the application of a valid design and development plan in coordination with reliability, quality and configuration control management. Quality assurance functions include component standardization, checking imported parts, assuring the quality of domestic parts from the earliest stages, and collecting and transmitting reliability information. Author (ESA)

N82-24370# Communications Satellite Corp., Clarksburg, Md.

PRODUCT ASSURANCE REQUIREMENTS FOR THE INTELSAT 6 SATELLITE SERIES **c38**

R. Strauss and I. Feigenbaum *In* ESA 2nd ESA Product Assurance Symp. Jan. 1982 p 49-56 refs Sponsored in part by International Telecommunications Satellite Oganization (For primary document see N82-24362 15-31)

Avail: NTIS HC A11/MF A01; ESA, Paris FF 140 Member States, AU, CN and NO (+20% others)

The use of product assurance requirements and programs in INTELSAT programs is reviewed. Both INTELSAT 1 and 2 used NASA procedures. The INTELSAT 3 program contained formalized reliability goals, quality assurance specifications, and incentive payments. The product assurance program was the basis for improved designs for later satellites. The INTELSAT 4 series included a product assurance program from the precontract stage. The INTELSAT 5 plan emphasizes improved failure reporting, and reliability stress analysis. For Intelsat 6, the definition of primary and secondary responsibilities for product assurance personnel and interfacing organizations is stressed. The contract requires subcontractor assurance plans, schedules for program status reviews, and participation of contractor and INTELSAT personnel in review boards and contractor, subcontractor and vendor activities. Author (ESA)

N82-24371# Beijing Inst. of Control Engineering (China).

A NEW APPROACH FOR FAULT-TREE ANALYSIS **c38**

Liao Jion-sheng *In* ESA 2nd ESA Prod. Assurance Symp. Jan. 1982 p 57-62 refs (For primary document see N82-24362 15-31)

Avail: NTIS HC A11/MF A01; ESA, Paris FF 140 Member States, AU, CN and NO (+20% others)

The disjoint manipulation rules (DMR) of Boolean algebra used to write the disjoint failure function directly from a fault tree (FT) are discussed. Programs which enumerate minimal cut sets, prime implicit sets, and transform the system failure function to disjoint form are simplified to a unique program. The coherent and noncoherent systems can be handled consistently. The FT decomposition and reduction techniques are combined. Each module is replaced by a pseudo basic event from the FT, and

replicated modules are discarded. The effective size of the FT is the number of events remaining after the modules are replaced, and the amount of computation decreases exponentially.
Author (ESA)

N82-24372# Aerospace Corp., Los Angeles, Calif.
NAVSTAR/GLOBAL POSITIONING SYSTEM PRODUCT ASSURANCE PROGRAM **c38**
Allan J. Boardman *In* ESA 2nd Prod. Assurance Symp. Jan. 1982 p 63-72 (For primary document see N82-24362 15-31)
Avail: NTIS HC A11/MF A01; ESA, Paris FF 140 Member States, AU, CN and NO (+20% others)

The global positioning system (GPS) is introduced and the product assurance program is reviewed. The GPS is a satellite based system for all weather, real time, three dimensional navigation and positioning at any location on or near the Earth. System accuracy is 16 m spherical error probability in positioning, 0.1 m/sec in velocity, and 35 nsec in time. The satellites are subjected to a contractor test program 90% compliant with MIL-STD-1540. For parts control, an internal specification based on Space Division standard 73-2C is applied. On an average, 16 part failures in component tests and 3 in system tests are recorded per satellite. The operational control system (OCS) availability requirement of 0.98 can be met 24 hr/day for 10 yr by each OCS element. Author (ESA)

N82-24373# British Aerospace Dynamics Group, Stevenage (England).
PRIME PRODUCT ASSURANCE MANAGEMENT (FUTURE TRENDS) **c38**
S. G. Wilson *In* ESA 2nd ESA Prod. Assurance Symp. Jan. 1982 p 75-78 (For primary document see N82-24362 15-31)
Avail: NTIS HC A11/MF A01; ESA, Paris FF 140 Member States, AU, CN and NO (+20% others)

Safety, reliability, and parts engineering, materials and process control, radiation protection quality assurance and management are discussed. Streamlining procedures are suggested, including the removal of radiation and safety from product assurance responsibilities, and the formation of a pool of approved companies through a control auditing agency is suggested to reduce audit and assurance plan writing.
Author (ESA)

N82-24374# Selenia S.p.A., Rome (Italy).
A SUBCONTRACTOR'S APPROACH TO PRODUCT ASSURANCE AND SPECIAL PROBLEMS ENCOUNTERED **c38**
A. Vitacolonna *In* ESA 2nd ESA Prod. Assurance Symp. Jan. 1982 p 79-84 (For primary document see N82-24362 15-31)
Avail: NTIS HC A11/MF A01; ESA, Paris FF 140 Member States, AU, CN and NO (+20% others)

Greater standardization by ESA in preferred component listing, the specification system, and procurement policy is urged. Centralized procurement, with policy defined at program outset, and parts issued free to users is advocated. The experience of the Selenia company in aerospace contracts illustrates the problems caused by the disjointed approach of ESA, e.g., the three different product assurance programs for Ariane, Spacelab and satellites. Author (ESA)

N82-24375# Royal Netherlands Aircraft Factories Fokker, Schiphol-Oost. Space Div.
SERVING MANY DIFFERENT CUSTOMERS IN SPACE ACTIVITIES **c81**
H. B. Rouws *In* ESA 2nd ESA Prod. Assurance Symp. Jan. 1982 p 85-93 ref (For primary document see N82-24362 15-31)
Avail: NTIS HC A11/MF A01; ESA, Paris FF 140 Members States, AU, CN and NO (+20% others)

Fokker product assurance programs for Ariane, Dutch space projects and ESA programs are discussed. For Ariane, in-house procedures were approved by the main contractors. For national programs, a consortium level plan is agreed upon with other contractors. The ESA quality assurance and configuration management procedures are criticized as time wasting and costly. The use of in-house systems, open to evaluation and audit, is advocated. Author (ESA)

N82-24376# General Electric Co., Philadelphia, Pa. Space Systems div.
SYSTEM EFFECTIVENESS ACTIVITIES IN SUPPORT OF LONG LIFE COMMUNICATIONS SATELLITES **c15**
Paul Dick *In* ESA 2nd ESA Prod. Assurance Symp. Jan. 1982 p 95-104 (For primary document see N82-24362 15-31)
Avail: NTIS HC A11/MF A01; ESA, Paris FF 140 Member States, AU, CN and NO (+20% others)

Action taken to overcome problems with latching relays, RF transistors, Schottky diodes, traveling wave tubes, hybrid circuits, and printed wire boards is described. The roles of product design control, quality assurance, parts, materials and processes control, reliability, safety and acceptance tests are highlighted. The current flow in relays which is blocked by a microscopic carbonaceous film is discussed. The transistors fail because of a parasitic oscillation within the transmitter and the repeated pulse degradation mechanism of the diodes is incorrect. Toluene cleaning causes conformal coatings to swell by up to 70%, breaking wire bonds in hybrid circuits, while a short between a diode and a hole on the circuit board causes printed wire boards to fail. Contact between a transformer winding and around potential wire which leads to short circuits in traveling wave tubes is discussed. Author (ESA)

N82-24377# Spar Aerospace Products Ltd., Toronto (Ontario). Remote Manipulator Systems Div.
A CANADIAN APPROACH TO PRODUCT ASSURANCE IN SPACE ACTIVITIES **c38**
P. N. Ibbotson and B. Thomas *In* ESA 2nd ESA Prod. Assurance Symp. Jan. 1982 p 105-111 refs (For primary document see N82-24362 15-31)
Avail: NTIS HC A11/MF A01; ESA, Paris FF 140 Member States, AU, CN and NO (+20% others)

Canadian space programs are reviewed, and product assurance techniques are outlined. Program planning ensures compliance with contract and minimizes risk. Failure mode and effects analysis is performed at system and black box level. Circuit analysis, starting at each input, traces signals to intended destination and confirms no other possible destination. Destructive tests ensure subcontracted components reliability. Author (ESA)

N82-24378# Thomson-CSF, Orsay (France).
ESTABLISHING CONFIDENCE IN ADVANCED TECHNOLOGIES FOR SPACE APPLICATIONS **c38**
J. P. Plantard and F. Violet *In* ESA 2nd ESA Prod. Assurance Symp. Jan. 1982 p 115-120 (For primary document see N82-24362 15-31)
Avail: NTIS HC A11/MF A01; ESA, Paris FF 140 Member States, AU, CN and NO (+20% others)

Assurance of surface acoustic wave components (ACW) and integrated optical components (IOC) is discussed. For ACW, testing should include radiation tests, scanning electron microscopy, connection tests, layer adherence, three dimensional vibration tests (10 to 2000 Hz) three dimensional constant acceleration tests up to 2000 g, and 160 hr thermal cycles from -65 to +125 C. The IOC should undergo vibration tests on the substrate and fiber-integrated optical element coupling, constant acceleration, thermal cycle tests, and water tightness checks.
Author (ESA)

N82-24379# Centre National d'Etudes Spatiales, Toulouse (France).
SPACE COMPONENTS COORDINATION: RESULTS AND OUTLOOK **c81**
Henri Arciszewski *In* ESA 2nd ESA Prod. Assurance Symp. Jan. 1982 p 121-131 (For primary document see N82-24362 15-31)
Avail: NTIS HC A11/MF A01; ESA, Paris FF 140 Member States, AU, CN and NO (+20% others)

The activities of the ESA space components coordination group (SCCG) are outlined, i.e, development and maintenance of the ESA/SCCG specification system for standard components and advanced technologies; qualification and maintenance of qualification of components manufactured in Europe to promote the usage thereof for ESA and national space projects; and incorporation of SCCG space component requirements in the Cenelec electronic components committee. Over 100 qualified sources covering 400 different types of component are available.

European manufacturers supply 70% to 80% of components.
Author (ESA)

N82-24380# Asternetics and Associates, Inc., Manhattan. Beach, Calif.
FAILURE RATE STUDY **c38**
D. L. Stern *In* ESA 2nd ESA Product Assurance Symp. Jan. 1982 p 133-137 (For primary document see N82-24362 15-31)
Avail: NTIS HC A11/MF A01; ESA, Paris FF 140 Member States, AU, CN and NO (+20% others)

The adoption of ERS/HIP-01-302 Issue 1 of June 1981, 'Failure rates for ESA spacecraft and associated equipment' as ESA specification QRA-14 is discussed. The addition of MIL-M-38510 classes S and B, 19500 class S, and 19500 JANTXV flows is proposed. The adequacy of functional categories for monolithic linear integrated circuits, hybrid integrated circuits, random access memories, transistors, microprocessors, microcomputers, semicustom gate arrays, and solid state relays is discussed. Author (ESA)

N82-24381# Fleet Missile Systems Analysis and Evaluation Group Annex, Corona, Calif. GIDEP Operations Center.
GIDEP, A TOOL FOR PRODUCT ASSURANCE **c38**
Edwin T. Richards *In* ESA 2nd ESA Prod. Assurance Symp. Jan. 1982 p 139-143 (For primary document see N82-24362 15-31)
Avail: NTIS HC A11/MF A01; ESA, Paris FF 140 Member States, AU, CN and NO (+20% others)

Techniques of data exchange through centralized technical data banks are reviewed, and program functions, e.g., the ALERT system and the urgent data request, are explained. The expansion of GIDEP into defective parts and components control and international reliability data exchange is discussed. Examples of cooperation achieved between government agencies and industry participants, and the benefits they gain through active program utilization, are described. Author (ESA)

N82-24382# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Space Div.
MICROPROCESSOR SYSTEMS FOR SPACE APPLICATIONS IN A RADIATION ENVIRONMENT **c60**
A. G. Stanley and R. Rieger *In* ESA 2nd ESA Prod. Assurance Symp. Jan. 1982 p 147-157 refs (For primary document see N82-24362 15-31)
Avail: NTIS HC A11/MF A01; ESA, Paris FF 140 Member States, AU, CN and NO (+20% others)

The testing of bipolar and hardened MOS systems is described. The devices are subjected to ionizing radiation up to a total dose of 10 million rad while working as a minisystem, executing a test program designed to provide diagnostic information about the functioning of component parts. Any temporary or permanent malfunction is automatically recorded. At intervals the microprocessor undergoes an extended vectored test program, containing both functional and parametric tests. After irradiation, the devices undergo isothermal and isochronal annealing. Extrapolations to dose rates encountered in space as well as predictions, regarding the physical failure mechanisms, are made. This is supplemented by low energy X-ray tests and by reirradiation, following annealing. Author (ESA)

N82-24383# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).
PROBLEMS AND CONSIDERATIONS FOR THE PROCUREMENT OF A 54K BIT CMOS RAM MEMORY HYBRID FOR LONG-TERM HIGH RELIABILITY SPACE APPLICATION **c38**
Erhard Jantz *In* ESA 2nd ESA Prod. Assurance Symp. Jan. 1982 p 159-165 refs (For primary document see N82-24362 15-31)
Avail: NTIS HC A11/MF A01; ESA, Paris FF 140 Member States, AU, CN and NO (+20% others)

Because of high rejection rates for fully screened memory hybrids, failure analysis was performed on memory dice, using scanning electron microscopy, electron microprobe and die etching. This reveals discontinuity in the V sub DD diffusion line, bridging material between polysilicon layers and nonlinearity between polysilicon and metallization. Circuit design analysis shows excessive step thickness when descending into diffusion contacts from two levels of polysilicon, contact resistance and nonlinearity, questionable clearance between contacts to gate edge, poor metal coverage, poor input protection, susceptibility to latchup, and diminishing low noise immunity. The die was replaced. Author (ESA)

N82-24384# National Centre of Systems Reliability, Warrington (England).
SOFTWARE RELIABILITY **c61**
B. K. Daniels *In* ESA 2nd ESA Prod. Assurance Symp. Jan. 1982 p 167-183 refs (For primary document see N82-24362 15-31)
Avail: NTIS HC A11/MF A01; ESA, Paris FF 140 Member States, AU, CN and NO (+20% others)

Reliability analysis techniques developed for hardware are reviewed, the inputs to a software analysis are considered, and a methodology for assessing software is presented. The methodology is based on a check list of questions, with an indication of where quantification is relevant. It covers the requirements/specification phase, design phase, implementation, checkout, and maintenance. Error processes which lead to faults then failure are expected to predominate in the design and implementation phases. Author (ESA)

N82-24385# Academy of Science of Water Conservancy and Electric Power, Beijing (China).
SYNTHESIS OF SYSTEM RELIABILITY **c38**
He Guo-Wei *In* ESA 2nd ESA Prod. Assurance Symp. Jan. 1982 p 185-189 ref (For primary document see N82-24362 15-31)
Avail: NTIS HC A11/MF A01; ESA, Paris FF 140 Member States, AU, CN and NO (+20% others)

Methods and formulas for finding confidence limits on system reliability as a function of the results of subsystem tests are presented. The synthesis of system reliability is defined as the relation between q sub L and q sub L1, q sub L2 .... q sub L k, where k = number of subsystems, and q sub L is the lower confidence limit on the reliability Q of a system with confidence coefficient lambda. The cumulative function of reliability estimation, F (sub q L), is defined as P (Q < q sub L) = 1 - lambda = alpha. F (q sub L) can be derived by classical or Bayesian methods. It is approximately the same as the cumulative function of a Beta distribution. Author (ESA)

N82-24386# TRW, Inc., Redondo Beach, Calif. Space and Technology Group.
SOFTWARE PRODUCT ASSURANCE: LEARNING LESSONS FROM HARDWARE **c61**
Eugene Sloane and Joseph Wrobleski *In* ESA 2nd ESA Prod. Assurance Symp. Jan. 1982 p 191-200 refs (For primary document see N82-24362 15-31)
Avail: NTIS HC A11/MF A01; ESA, Paris FF 140 Member States, AU, CN and NO (+20% others)

The application of failure mode and effects analysis (FMEA) and critical item control to software is discussed. System FMEA for a satellite computer is shown. It emphasizes software functions, e.g., attitude control, and the effects of software failure on hardware performance. Unit interface FMEA is achieved by analyzing logic flow between routines in a program or between programs. Sotfware errors are hypothesized and failure effects followed through in order to determine effects on hardware and software. Piece part FMEA is limited to elements whose failure causes immediate loss of the mission. Critical item plans can be generated for mission critical sotfware and software deemed risky because of unusual procedures of difficulty in meeting specifications. Variables can be tested at or over limits. Critical timing threads can be stress tested to the maximum. Error checking and redundant software can be used. Author (ESA)

N82-24387# Erno Raumfahrttechnik G.m.b.H., Bremen (West Germany).
ASSURANCE OF A MANNED SPACE PROGRAM **c38**
Juergen Levold *In* ESA 2nd ESA Product Assurance Symp. Jan. 1982 p 203-211 refs (For primary document see N82-24362 15-31)
Avail: NTIS HC A11/MF A01; ESA, Paris FF 140 Member States, AU, CN and NO (+20% others)

The Spacelab assurance program is outlined and the safety

aspects of manned spaceborne experiments are discussed. Four residual hazards are accepted: meteorite damage to external equipment; meteorite penetration of the module shell with rapid pressure drop; inability to detect a toxic atmosphere; and nitrogen enrichment in the airlock shortly after repressurization. Toxic, carcinogenic, shatterable and other dangerous materials are excluded. Strict flammability and offgassing criteria apply. Any element with < 200 theoretical missions is considered life limited. The statistical reliability concept is supplemented by failsafe and safe life philosophies and secondary consequences of failures are evaluated for safety hazards. Author (ESA)

N82-24388# Aeritalia S.p.A., Torino (Italy).
FRACTURE CONTROL PROGRAM TO ENSURE STRUCTURAL SAFETY c38
G. Surbone *In* ESA 2nd ESA Prod. Assurance Symp. Jan. 1982 p 213-221 refs (For primary document see N82-24362 15-31)
Avail: NTIS HC A11/MF A01; ESA, Paris FF 140 Member States, AU, CN and NO (+20% others)

Fracture mechanic techniques were applied on Spacelab module pressure shell design in order to meet safe life requirements, assuming that the structure is not defect free. The fracture control program is described, highlighting product assurance. This program includes structural design, fracture mechanics analysis, material selection, procurement and manufacturing control, nondestructive methods evaluation, and vehicle operation and maintenance. Fracture mechanic techniques were used to evaluate and accept weld defects out of specification on Spacelab module pressure shell welds. Author (ESA)

N82-24389# European Space Research and Technology Center, Noordwijk (Netherlands).
COMPONENT PROCUREMENT FOR ESA PROJECTS c81
U. Ernsberger *In* ESA 2nd ESA Prod. Assurance Symp. Jan. 1982 p 225-229 (For primary document see N82-24362 15-31)
Avail: NTIS HC A11/MF A01; ESA, Paris FF 140 Member States, AU, CN and NO (+20% others)

Factors which delay component delivery are reviewed. Centralized procurement is advocated because it uses manpower optimally, avoids duplicating effort, reduces cost, and reduces lead times by simplifying procedure. The prime contractor should appoint a parts program manager, responsible to project management. If he coordinates and directs activities, including interfaces, necessary for program execution, product assurance personnel can concentrate on quality and reliability control. A consortium-wide procurement organization would prevent loss of know how caused by disbanding program teams. Time schedule problems can be reduced if major procurement starts in the design development phase, adequate funding is provided in time, and a close monitoring and control system is applied.
Author (ESA)

N82-24390# Illinois Univ. at Urbana-Champaign.
IMPROVING THE EFFICIENCY OF REFRIGERATORS AND HEAT PUMPS BY USING A NONAZEOTROPIC MIXTURE OF REFRIGERANTS M.S. Thesis
Philippe F. Launax Oct. 1981 117 p refs
(Contract W-7405-eng-26)
(DE82-001840; ORNL/Sub-81/7762/1) Avail: NTIS HC A06/MF A01

It was found that refrigerant mixtures have a potential for energy savings. The current status of the applications of refrigerant mixtures is examined. An experimental facility designed to compare quantitatively the performance of refrigerant mixtures of varying composition while getting relevant data (e.g., heat transfer coefficients) is described and a computer simulation of this facility including an optimization study is presented. Although no experimental evidence is available at this time the possibility of energy conservation by the use of refrigerant mixtures is confirmed analytically. The optimization study shows that optimal use of a mixture can be achieved with a system somewhat simpler than what was originally expected. DOE

N82-24391# California Univ., Berkeley. Lawrence Berkeley Lab. Energy and Environment Div.
CALIFORNIA EXPERIENCE WITH ENERGY CONSERVATION STANDARDS FOR BUILDINGS
Robert Feinbaum May 1981 142 p refs
(Contract W-7405-eng-48)
(DE81-000972; LBL-12731) Avail: NTIS HC A07/MF A01

Results of California's development and implementation study of its Title 24 Energy Conservation standards are presented. The Title 24 standards are compared with the National Building Energy Performance Standards. Results show implementation difficulties occurred in starting up the program and information dissemination. Local enforcement practices proved variable and ambiquities in the standards created special problems for building officials. These problems are discussed in detail. Innovative approaches such as use of computer calculations proved difficult for approval and this problem is discussed. Attitudes toward standards are described. Details on the structure of the home building industry in California are given. Measures taken by the California Energy Commission to review and update the standards are described. DOE

N82-24392# Foster-Miller Associates, Inc., Waltham, Mass.
IMPROVEMENT OF DEVICE (CMD) FOR MONITORING THE CONSOLIDATION OF PLASTIC CONCRETE Final Report
George J. Kirby and Richard W. Lusignea Aug. 1981 72 p refs
(Contract DOT-FH-11-9630)
(PB82-132390; FHWA/RD-81/117; DOT-7932) Avail: NTIS HC A04/MF A01 CSCL 13C

The development of an automatic distance gauging system for use in a device (CMD) for monitoring the consolidation of a portland cement concrete pavement is decribed. The capactive distance gauging system measures the air gap between the surface of the pavement and the bottom of a gamma backscatter instrument for density monitoring. The incorporation of the capacitance gauging system has made the density measurement independent of air gap height variations normally encountered as the concrete pavement surface is extruded behind a paving machine. Laboratory and field testing programs are described, and recommendations are made for further development and application of the density monitoring system. GRA

N82-24393# National Bureau of Standards, Washington, D.C. National Engineering Lab.
ENGINEERING: ECONOMIC ANALYSIS OF IMPROVED HEAT PUMP PERFORMANCE FOR MINIMUM STANDARDS DEVELOPMENT Final Report
Stephen R. Petersen, Kimberly A. Barnes, and George E. Kelly Jul. 1981 68 p refs Sponsored in part by DOE
(PB82-133810; NBSIR-81-2241) Avail: NTIS HC A04/MF A01 CSCL 13A

A methodology and seasonal performance data are given that could be used in the development of a reference basis for minimum efficiency standards for heat pumps that are economically justified on a life cycle basis. Criteria for economic optimization are outlined. The methodology used to computer seasonal heating and cooling performance ratings and the annual energy savings resulting from efficiency improvements, by climate region, is detailed. The interdependence between efficiency ratings in the heating and cooling modes is explored using statistical analysis. An example of the procedure for determining maximum cost effective efficiency levels is demonstrated for a 36,000 Btu/h heat pump. Author (GRA)

N82-24394# National Bureau of Standards, Washington, D.C. National Engineering Lab.
SOLAR INDUSTRIAL PROCESS HEAT SYSTEMS: AN ASSESSMENT OF STANDARDS FOR MATERIALS AND COMPONENTS
Walter J. Rossiter and Walter E. Shipp Sep. 1981 98 p refs Sponsored in part by DOE
(PB82-133703; NBSIR-81-2381) Avail: NTIS HC A05/MF A01 CSCL 13A

A study was conducted to obtain information on the performance of materials and components in operational solar industrial process heat (PH) systems, and to provide recommendations for the development of standards including evaluative test procedures for materials and components. An assessment of the needs for standards for evaluating the long-term performance of materials and components of IPH systems was made. The assessment was based on the availability of existing standards,

and information obtained from a field survey of operational systems, the literature, and discussions with individuals in the industry. Field inspections of 10 operational IPH systems were performed. Author (GRA)

N82-24395# North Carolina State Univ. at Raleigh. Highway Research Program.
MIXING WATER AND MATURITY OF HARDENED CONCRETE USING SCANNING ELECTRON MICROSCOPE TECHNIQUES, PART 1 Final Report, Aug. 1978 - Jun. 1981
W. G. Mullen and B. D. Barnes Jun. 1981 67 p refs Prepared in cooperation with North Carolina Dept. of Transportation
(PB82-133729; ERSD-110-79-5; FHWA/NC-81/004-Pt-1) Avail: NTIS HC A04/MF A01 CSCL 13C

Photographic comparison standards and an analysis procedure for their use have been developed to aid in the determination of the age of hydration and the water-cement ratio of hardened concrete. The standards are sets of nine photographs of concrete at a range of ages and water-cement ratios taken at 1200X magnification using the scanning electron microscope (SEM). Concretes were made at nine different water-cement ratios. An array of 63 sets of nine photographs, one for each age at each water-cement ratio resulted. Nine factors of features of the hydration matrix that can be used to estimte age of hydration and water-cement ratio of an unknown concrete sample are given. Author (GRA)

N82-24396# National Bureau of Standards, Washington, D.C. Thermophysical Properties Div.
THERMAL CONDUCTIVITY OF A CONCRETE MORTAR FROM 95 K TO 320 K
L. L. Sparks Oct. 1981 17 p refs Sponsored in part by Maritime Administration
(PB82-134370; NBSIR-81-1651) Avail: NTIS HC A02/MF A01 CSCL 13C

The thermal conductivity of a single concrete mortar specimen with varying moisture content is reported in the temperature range from 95 to 320 K. The measurements were made in a guarded-hot-plate apparatus. Moisture migration caused by temperature gradients was minimized by studying the saturated specimen in the low-temperature region. Specimen moisture content and concomitant thermal conductivity were altered by imposing low-pressure, high-temperature conditions on the specimen. The effect of changing the moisture content is discussed. Author (GRA)

N82-24397# Cambridge Univ. (England). Dept. of Engineering.
HOMEP: AN ALGORITHM FOR ANALYSING HOMOGENEOUS STRESS/STRAIN HISTORIES
C. M. Szalwinski 1981 103 p Sponsored in part by Transport and Road Research Lab.
(PB82-134644; CUED/D-SOILS/TR-115-1981; ISSN-0309-7439) Avail: NTIS HC A06/MF A01 CSCL 08M

An algorithm for transforming strain history into stress history, and vice versa, is described. It is called HOMEP and pertains to a single homogeneous material element. It is intended for analyses in soil mechanics where the constitutive relations are significantly nonlinear. Several relations including modified cam clay (of critical state soil mechanics) are available. Its results can be stored on auxiliary file for postprocessing by plotting algorithms. GRA

32 COMMUNICATIONS

Includes land and global communications; communications theory; and optical communications.

For related information see also *04 Aircraft Communications and Navigation* and *17 Spacecraft Communications, Command and Tracking*.

N82-24398 Forschungsinstitut fuer Hochfrequenzphysik, Werthhoven (West Germany).
MULTISTATIC SONAR WITH RANGE-ONLY INFORMATION
F. Dommeruth Apr. 1981 71 p refs In GERMAN; ENGLISH summary
(Contract BMVg-GF-80)
(Rept-4-81; Lfd-188) Copyright. Avail: Issuing Activity

A multistatic sonar system, consisting of an isotropically radiating source and several omnidirectional receivers distributed over the surveillance area, is described. Only the echo arrival times are transmitted to a central processor. This processor decides whether or not a target is present within the surveillance area and also approximately determines the position of a detected target. Based on a specific scanning pattern, various test procedures were investigated with respect to their power. The primitive coincidence test is nearly optimal. A post detection system drastically reduces false alarms. This multistatic sonar system can only compete with a monostatic system if many receivers are positioned in the potential target neighborhood. Author (ESA)

N82-24399*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
TELECOMMUNICATIONS AND DATA ACQUISITION SYSTEMS SUPPORT FOR THE VIKING 1975 MISSION TO MARS, VOLUME 5 Progress Report, 1 Jun. 1978 - 30 Apr. 1980
W. E. Larkin 15 Apr. 1982 24 p refs 5 Vol.
(Contract NAS7-100)
(NASA-CR-168921; NAS 1.26:168921; JPL-PUB-82-18) Avail: NTIS HC A02/MF A01 CSCL 17B

The support provided by the Deep Space Network to the Viking Project from 1 June 1978 to 30 April 1980 is described. The project was supported by the worldwide network of Deep Space Stations with 26- and 64-meter-diameter antennas, together with a ground communications system, for the transmission of commands, telemetry, radio metric data, and operational instructions between the stations and the network operation control center in Pasadena, California. Assistance was substantially less than in the previous phases of the Viking Project in order to provide adequate support to the Pioneer and Voyager Projects. Author

N82-24400# Communications Research Centre, Ottawa (Ontario). Radar and Communications Technology Branch.
DUAL TONE MULTI-FREQUENCY (DTMF) AUTOMATIC RADIO TELEPHONE INTERCONNECT (RTI) SYSTEMS
J. S. Belrose and L. R. Bode Feb. 1982 50 p refs
(CRC-TN-700) Avail: NTIS HC A03/MF A01

The development of improved very high frequency ultrahigh frequency (VHF/UHF)-FM or high frequency single sideband transmission radio communications is discussed. The concept of automatic connectivity to other radio systems, to private lines or to the switched public telephone system is discussed. Research and development carried out the past 5 years to develop simple, inexpensive radio telephone interconnect systems that could be employed to improve communications from the trail and from remote camps by northern and native people are discussed. The research culminated in the development and field trial of prototype systems. Repeater remote control and dual tone multifrequency cone signaling for both FM and single sideband transmission signaling systems are discussed. R.J.F.

N82-24401# Naval Research Lab., Washington, D. C.
ELECTROMAGNETIC PULSE (EMP) HANDBOOK DEVELOPMENT FOR THE DEFENSE NUCLEAR AGENCY (DNA) Annual Report, 1 Oct. 1980 - 30 Sep. 1981
J. M. Pierre 22 Feb. 1982 108 p Sponsored in part by DNA
(AD-A111419; NRL-MR-4734) Avail: NTIS HC A06/MF A01 CSCL 20/14

During FY 81, the Defense Nuclear Agency (DNA) initiated a program with the Naval Research Laboratory to provide technical and management support in the development of an electromagnetic pulse (EMP) handbook for ground based facilities. The focus of the handbook program during the first year was on the assessment of the data needs of the EMP user community and the adequacy of the existing data base. This report provides a summary of the activities, findings, and accomplishments during the past year in the EMP handbook development area. Author (GRA)

N82-24402# Stanford Univ., Calif. Computer Systems Lab.
SIMULATION OF MESSAGE-BASED PRIORITY FUNCTIONS IN CARRIER SENSE MULTIACCESS/BROADCAST SYSTEMS
Noel Gonzalez-Cawley and Fouad A. Tobagi 1 Jun. 1981 98 p refs
(Contract DAAG29-79-C-0138)
(AD-A112564; TR-213; ARO-16783.2-A-EL) Avail: NTIS HC A05/MF A01 CSCL 17/2

The need for priority functions in Multiaccess Computer Communication Networks arises from applications with restrictions on packet delay. One alternative is to have a dedicated channel supporting very low loads to insure small delays; another alternative is to provide some priority mechanism by which packets that are time constrained can have priority over those which are not. One such mechanism, called Prioritized Carrier Sense Multiple Access (P-CSMA), recently proposed and analyzed by Tobagi (10-12), is studied here using simulation. The objective of this work is to extend the results obtained by the stochastic analysis and evaluate more completely the performance of P-CSMA. Three variations of the operation of the protocol are investigated, namely: nonpreemptive, semipreemptive and preemptive disciplines. In particular, we study the effect on average packet delay, packet loss and the variance of delay of several system parameters that prove to be interesting, such as: the number of stations, the number of buffers, the preemption discipline, etc. It is shown that priority functions indeed reduce packet delay, delay variance and packet loss for the high priority class. GRA

N82-24403# Research Inst. of National Defence, Linkoeping (Sweden).
IONIZING RADIATION, A THREAT TO MODERN ELECTRONICS: AN ELEMENTARY INTRODUCTION [JONISERANDE STRAALNING - ETT HOT MOT DEN MODERNA ELEKTRONIKEN? EN ELEMENTAER INTRODUKTION]
Lennart Hagstroem Dec. 1981 96 p refs In SWEDISH
(FOA-A-30031-E) Avail: NTIS HC A05/MF A01

Radiation effects on materials are described with emphasis on vulnerability of semiconductors. These effects are either transient or permanent and depend on environment, e.g., extraterrestrial or nuclear explosion radiation. Defects in crystals, optical devices and optical waveguides, due to ionizing radiation, are considered. Damage to electronic devices is presented as a components and materials problem, which is generally not solved by shielding, but rather by decreasing system susceptibility to radiation (hardening). Examples of hardening are given. Test specification for nuclear weapon irradiation of electronic devices are indicated and test methods are mentioned. Author (ESA)

N82-24404# Fondazione Ugo Bordoni, Rome (Italy).
ON THE EVALUATION OF RADIOPROPAGATION AND INTERFERENCE EFFECTS ON THE ANGULAR ESTIMATE ERROR FOR THE PROPOSED MONOPULSE RECEIVERS Final Report [RAPPORTO CONCLUSIVO SULLA VALUTAZIONE DELLA RADIOPROPAGAZIONE E DEGLI EFFETTI DELLE INTERFERENZE SULLA STIMA ANGOLARE DELLA SOLUZIONE MONOPULSE PRESCELTA]
G. Biffi Gentili and D. Giuli 1981 51 p refs In ITALIAN; ENGLISH summary Sponsored by CNR, Florence
(FUB-II/A/4.23) Avail: NTIS HC A04/MF A01

The performance of monopulse receivers in the presence of interference was analyzed. The errors in the azimuth estimate caused by active or passive interference in secondary radar monopulse receivers of the types ADSEL, CHUBB and DABS are compared in order to choose the receiver to be employed in the secondary radar for the Italian air traffic control project. Both mainlobe and sidelobe interference are considered. Under strong interference, errors are large in all three types of receivers. In the case of weak interference, the DABS receiver shows the best performance, particularly in the case of interference from other stations. Author (ESA)

N82-24405# Fondazione Ugo Bordoni, Rome (Italy).
RAIN INDUCED ATTENUATION STATISTICS IN THE 20/30 GHz AND 40/50 GHz BANDS USED FOR COMMUNICATIONS VIA SATELLITE WITHIN THE NATIONAL TERRITORY [STATISCHE DELL'ATTENUAZIONE DOVUTA A PIOGGIA NELLE BANDE 20/30 GHz E 40/50 GHz PER COLLEGAMENTIA VIA SATELLITE NEL TERRITORI O NAZIONALE]
Francesco Fedi, Ermete Bucci (Telespazio S.p.A.), Paolo Ferrazzoli (Telespazio S.p.A.), and Aldo Paraboni (Centro Studi Telecommunicazione Spaziali) Oct. 1981 16 p refs In ITALIAN
(FUB-13-1981) Avail: NTIS HC A02/MF A01

A rain attenuation statistics prediction method is described. The method requires the knowledge of four parameters: the rain intensity level corresponding to a 0.01 time fraction of an average year, the altitude, the latitude and the elevation angle of the communication beam. The difference between predicted values and actual measurements taken by means of Sirio and OTS satellites in the II GHz band show that the deviations are of the order of magnitude of the experimental error. Attenuation statistics predicted for the Italian territory for 20, 30, 40 and 50 GHz are presented. Author (ESA)

N82-24406# Fondazione Ugo Bordoni, Rome (Italy).
THE PROCEDURE 'OPRE' FOR THE OPTIMIZATION OF A TRANSMISSION NETWORK SATISFYING A FIXED PROTECTION LEVEL [LA PROCEDURE OPRE PER L'OTTIMIZZAZIONE DI UNA RETE TRASMISSIVA SODDISFACENTE ASSEGNATI VINCOLI DI PROTEZIONE]
Ugo Mocci and Giacomo Ravaioli May 1981 10 p refs In ITALIAN Presented at 24th Intern. Conv. on Communications, Genoa, 6-9 Oct. 1981
(FUB-14-1981) Avail: NTIS HC A02/MF A01

A transmission network can be protected either by routing traffic along disjoint paths or by rerouting interrupted capacities through a standby network. A procedure to find the minimum total cost combination of the protective measures under the constraint of a fixed protection level is described. The protection level is defined as the maximum permissible reduction of capacity for any given failure condition. The results of the application of the optimization procedure to a test network are reported. Author (ESA)

N82-24407# Fondazione Ugo Bordoni, Rome (Italy).
OUTSTANDING PROPERTIES OF BISTOCHASTIC MATRICES [PROPRIETA NOTEVOLI DELLE MATRICI BISTOCASTICHE]
Odoardo Brugia and William Wolfowicz Oct. 1981 8 p refs In ITALIAN
(FUB-15-1981) Avail: NTIS HC A02/MF A01

The statistical properties of many devices used in communication systems, such as scramblers and line coding and decoding devices, are described by mathematical models in which the transition probability matrix is bistochastic. To facilitate the analysis of systems response, the specific properties of the bistochastic matrices are described in six theorems which are demonstrated. Author (ESA)

N82-24408# Fondazione Ugo Bordoni, Rome (Italy).
EXPERIMENTAL INVESTIGATION OF SOUND SEGMENTS DISCRIMINATION AND TIME ALIGNMENT OF SPEECH FOR A SPEAKER RECOGNITION AUTOMATIC SYSTEM [INDAGINE SPERIMENTALE SULLA DISCRIMINAZIONE DEI TRATTI SONORI E SULL'ALLINEAMENTO TEMPORALE DEL PARLATO PER UN SISTEMA AUTOMATICO DI RECONOSCIMENTO DEL PARLATORE]
Domenico DeSeta, Andrea Paolini, and Simona Scotti Dec. 1981 4 p In ITALIAN Presented at 9th AIA Conv., Bari, Italy, 1981
(FUB-24-1981) Avail: NTIS HC A02/MF A01

A speaker recognition experiment was performed, using a limited number of phrases with three repetitions of each phrase by six speakers. A block diagram of voice analysis is presented. The signal is sampled at a 10 kHz frequency and digitized at 12 bits per sample. The total is divided into segments of 256 samples. For each segment, the probability of being a voice signal is computed by means of the Mahalanobis distance between the segment parameters vector and the two reference parameter vectors, calculated by semiautomatic methods and introduced into the computerized procedure. The comparison of formant vectors in corresponding segments is obtained by a time-warping algorithm. The results of the experiment show a no recognition probability of 0.034 and a mistaken recognition probability of 0.076. Author (ESA)

N82-24409# Physics Lab. RVO-TNO, The Hague (Netherlands). Research Group 4: Microwaves.

COMPARISON OF SIMULTANEOUS ATMOSPHERIC ATTENUATION MEASUREMENTS AT VISIBLE LIGHT, INFRARED (3 TO 5 MICRONS) AND MM WAVES (94GHz)

J. H. Buijs and L. H. Janssen Jan. 1981 50 p refs
(Contract A74/K/079)
(PHL-1981-04; TDCK-75274) Avail: NTIS HC A03/MF A01

Rain, fog, humidity and snow attenuation is discussed. In rainshowers, predictions based on Mie scattering theory agree closely with experimental results. During these showers, excess attenuation due to rain is the same for infrared and visible light. The relationship between infrared and 94 GHz attenuation depends on the type of the shower. Almost the same results are found in snow and wet snow showers, except that 94 GHz waves are less affected by snow than infrared waves and visible light. During fog, visible light and infrared are seriously affected, while 94 GHz attenuation increases only slightly. Author (ESA)

N82-24410# Physics Lab. RVO-TNO, The Hague (Netherlands). Research Group 4: Microwaves.

SOME HIGH RANGE RESOLUTION (80 NSEC) SEA CLUTTER CHARACTERISTICS AT J-BAND FREQUENCIES

H. Sittrop Mar. 1981 43 p refs
(Contract A76/KM/007)
(PHL-1981-09; TDCK-75341) Avail: NTIS HC A03/MF A01

Measured radar backscatter per unit area (S) is compared with model predictions. A reasonable to good correlation is found between measurements and model predictions for vertical and horizontal polarization (pol VV and pol HH) at up and cross wind observations. At pol VV the measured downwind value corresponds very well with the crosswind model. At pol HH, measured values are lower than any of the predicted values within the indicated wind speed range. High range resolution clutter is non Rayleigh distributed, in particular at pol HH. The spread of S for short time series is larger at pol HH than at pol VV. Normalizing the radar return to its running mean makes the clutter Rayleigh distributed again. Author (ESA)

N82-24411# Institute for Perception RVO-TNO, Soesterberg (Netherlands).

CONSONANT LOCI: A SPECTRAL STUDY OF COARTICULATION, PART 3

M. E. H. Schouten and L. C. W. Pols 1980 10 p refs
(IZF-1980-5; TDCK-75107) Avail: NTIS HC A02/MF A01

Consonant loci were determined without extrapolation of voiced sample traces by disregarding the distinction between voiced and unvoiced samples. Unvoiced consonants occur as initial consonants before and as final consonants after every vowel, but since Dutch has no final voiced plosives or fricatives, /b, d, v, z/ were used in initial positions. Voiced consonants /m, n, r, l/ were used only in final positions. Three speakers uttered CVC words five times, both as isolated words, and as stressed syllables in a text. Positions are further to the right than previous values. Consonants are easier to separate in text than in the isolated words, indicating that in connected speech interspeaker variation with regard to consonants is smaller than in isolated words. Consonants /b/ and /d/ are very hard to distinguish, /p/ and /k/ in initial position overlap, and /t/ and /v/ cannot be distinguished spectrally. Author (ESA)

N82-24412# Institute for Perception RVO-TNO, Soesterberg (Netherlands).

PREDICTING SPEECH INTELLIGIBILITY IN ROOMS FROM THE MODULATION TRANSFER FUNCTION. PART 4: A RAY TRACING COMPUTER MODEL

H. F. vanRietschote, T. Houtgast, and H. J. M. Steeneken 1980 24 p refs
(IZF-1980-17; TDCK-75110) Avail: NTIS HC A02/MF A01

A computer model for calculating the speech transmission index (STI) in an auditorium which takes into account the geometrical and acoustical characteristics of room boundaries is described. The speaker is simulated by a point source emitting a large number of rays, e.g., 7000, and the audience by an area of spheres (radius 1 m), resulting in an STI value for each listener position. The model accounts for the influence of partly diffuse reflections, resulting in a hybrid model, i.e., a combination of ray tracing acoustics and statistical room acoustics. Model predictions agree quite well with STI values as measured for a variety of conditions. Author (ESA)

N82-24413# Technical Univ. of Denmark, Lyngby. Electromagnetics Inst.

A STUDY OF THE EFFECTS OF MEASURING IMPERFECTIONS OF AN IMAGING MICROWAVE RADIOMETER SYSTEM ON THE RETRIEVAL OF PHYSICAL PARAMETERS: EXECUTIVE SUMMARY Final Report

Finn Soendergaard and Bruno Wolff Paris ESA Aug. 1980 49 p refs
(Contract ESA-4301/80/F-CG)
(R-230; ESA-CR(P)-1520) Avail: NTIS HC A03/MF A01

Radiometer hardware specifications were determined by investigating the influence of antenna sidelobe and cross polarization level and receiver sensitivity on measurements. Computer models simulated the atmosphere, open sea, ice covered sea, a dual polarized multifrequency scanning antenna, and the radiometer receiver. A maximum likelihood linear algorithm estimated physical parameters from measured brightness temperatures. Open sea tests show that the diameter of the terrain cell should be at least 3 to 4 times smaller than the diameter of the 3 db footprint of the antenna. The diameter of the integrated area of the terrain must be at least 10 times the 3 db diameter of the antenna footprint. Author (ESA)

N82-24414# National Telecommunications and Information Administration, Washington, D.C.

SELECTIVE FADING ON A LONG 8 GHz LINE-OF-SIGHT PATH IN EUROPE Technical Report, 2 Jan. - 30 Dec. 1980

L. B. Hause Sep. 1981 97 p refs Sponsored in part by Defense Communications Engineering Center
(PB82-130519; NTIA/Rept-81/84) Avail: NTIS HC A05/MF A01 CSCL 17B

The description, analysis and results of a set of measurements made on a 90 km line-of-sight path are presented. Received signal level and IF spectrum were measured to obtain statistics about the distortion of the frequency spectrum amplitude during periods of multipath fading. Digital format violation and reframe events were monitored to measure the tolerance of the 3 level partial response radios (12.6 Mb/s) to this distortion. GRA

N82-24231# Centre National d'Etudes Spatiales, Toulouse (France).

ELECTROMAGNETIC COMPATIBILITY [COMPATIBILITE ELECTROMAGNETIQUE]

J.-P. Catani *In its* The Technol. of Spaceborne Sci. Expt. 1981 p 483-496 In FRENCH (For primary document see N82-24215 15-12)
Avail: NTIS HC A99/MF A01

N82-24265# Joint Publications Research Service, Arlington, Va.

INTERSPUTNIK COMMUNICATIONS SYSTEMS

V. Romantsov *In its* USSR Rept.: Space, No. 15 (JPRS-80424) 29 Mar. 1982 p 99-101 Transl. into ENGLISH from Aviats. Kosmonavt. (USSR), no. 10, Oct. 1981 p 40-41 (For primary document see N82-24253 15-12)
Avail: NTIS HC A07/MF A01

N82-25094*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

AN EFFICIENT SAMPLING TECHNIQUE FOR SUMS OF BANDPASS FUNCTIONS

W. M. Lawton *In its* The Telecommun. and Data Acquisition Rept. 15 Apr. 1982 p 3-7 refs (For primary document see N82-25092 15-99)
Avail: NTIS HC A09/MF A01 CSCL 20N

N82-25095*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

AN EXPERIMENTAL INVESTIGATION OF THE CHANGES OF VLBI TIME DELAYS DUE TO ANTENNA STRUCTURAL DEFORMATIONS

T. Y. Otoshi and L. E. Young *In its* The Telecommun. and Data Acquisition Rept. 15 Apr. 1982 p 8-16 refs (For primary document see N82-25092 15-99)
Avail: NTIS HC A09/MF A01 CSCL 20N

N82-25104*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
NEW CCIR PAPERS ON TELECOMMUNICATIONS FOR DEEP SPACE RESEARCH
N. F. OldeGroot *In its* The Telecommun. and Data Acquisition Rept. 15 Apr. 1982 p 86-102 refs (For primary document see N82-25092 15-99)
Avail: NTIS HC A09/MF A01 CSCL 17B

N82-25105*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
DSN RFI SUSCEPTIBILITY MODELS DEVELOPMENT PROGRAM OVERVIEW
M. K. Sue *In its* The Telecommun. and Data Acquisition Rept. 15 Apr. 1982 p 103-109 refs (For primary document see N82-25092 15-99)
Avail: NTIS HC A09/MF A01 CSCL 20N

N82-25106*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
RFI MEASUREMENT SURVEY AT GOLDSTONE IN NOVEMBER AND DECEMBER 1981
R. M. Taylor *In its* The Telecommun. and Data Acquisition Rept. 15 Apr. 1982 p 110-121 (For primary document see N82-25092 15-99)
Avail: NTIS HC A09/MF A01 CSCL 20N

N82-25107*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
OPERATIONS OF THE RECONFIGURED GROUND COMMUNICATIONS FACILITY CENTRAL COMMUNICATIONS TERMINAL AND THE NETWORK OPERATIONS CONTROL CENTER
J. C. Santana and L. E. Jennings *In its* The Telecommun. and Data Acquisition Rept. 15 Apr. 1982 p 122-129 refs (For primary document see N82-25092 15-99)
Avail: NTIS HC A09/MF A01 CSCL 17B

33 ELECTRONICS AND ELECTRICAL ENGINEERING

Includes test equipment and maintainability; components, e.g., tunnel diodes and transistors; microminiaturization; and integrated circuitry.

For related information see also *60 Computer Operations and Hardware* and *76 Solid-State Physics*.

N82-24415* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
MULTISTAGE DEPRESSED COLLECTOR FOR DUAL MODE OPERATION Patent
Henry C. Kosmahl, inventor (to NASA) Issued 7 Jul. 1981 6 p Filed 7 Sep. 1979 Supersedes N79-32463 (17 - 23, p 3080)
(NASA-Case-LEW-13282-1; US-Patent-4,277,721; US-Patent-Appl-SN-073579; US-Patent-Class-315-5.38; US-Patent-Class-315-3.6) Avail: US Patent and Trademark Office CSCL 09A

A depressed collector which captures the spent electrons of a microwave transmitting tube at high efficiency in both high and low power modes of operation is described. The collector comprises entrance and end electrodes, the end electrode having a spike extending toward entrance electrode. Intermediate electrodes and the entrance electrode each have a central aperture and, together, these electrodes capture most high power mode spent electrons. The apertures of the electrodes increase in size in a downstream direction. To capture low power mode spent electrons a low power mode electrode is positioned between the last intermediate electrode and the end electrode. This electrode has a central aperture preferably smaller but no larger than that of the last intermediate electrode. An auxiliary low power mode electrode may be added having a central aperture larger than that of the low power mode electrode. All of the electrodes are at voltages provided by a voltage divider connected between a potential.

Official Gazette of the U.S. Patent and Trademark Office

N82-24416* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
IMAGE READOUT DEVICE WITH ELECTRONICALLY VARIABLE SPATIAL RESOLUTION Patent
Harry A. Benz, inventor (to NASA) Issued 14 Jul. 1981 5 p Filed 28 Mar. 1980 Supersedes N80-22661 (18 - 13, p 1714)
(NASA-Case-LAR-12633-1; US-Patent-4,279,001; US-Patent-Appl-SN-135039; US-Patent-Class-358-213) Avail: US Patent and Trademark Office CSCL 09A

An invention relating to the use of a standing acoustic wave charge storage device as an image readout device is described. A frequency f sub 1 was applied to the storage transfer device to create a traveling electric field in the device in one direction along a straight line. A second frequency f sub 2 was applied to the charge transfer device to create a traveling electric field opposite to the first traveling electric field. A standing wave was created. When an image was focused on the charge transfer device, light was stored in the wells of the standing wave. When the frequency f sub 2 is removed from the device, the standing wave tends to break up and the charges stored move to an electrode connected to an output terminal and to a utilization device where the received charges represent the image on the surface of the charge transfer device along a projection of said straight line. M.D.K.

N82-24417* National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Center, Edwards, Calif.
SMOOTHING FILTER FOR DIGITAL TO ANALOG CONVERSION Patent
Charles A. Wagner, inventor (to NASA) 23 Jun. 1981 6 p Filed 25 Jan. 1980 Supersedes N80-17723 (18 - 08, p 1048)
(NASA-Case-FRC-11025-1; US-Patent-4,275,453; US-Patent-Appl-SN-115536; US-Patent-Class-364-825; US-Patent-Class-330-109; US-Patent-Class-330-290; US-Patent-Class-330-294; US-Patent-Class-330-306; US-Patent-Class-328-167) Avail: US Patent and Trademark Office CSCL 09A

An electronic filter comprised of three active filter sections to smooth the stepped signal from a digital to analog converter is described. The first section has a noninverting low pass filter transfer function, and the second has an inverting transfer function designed to pass a narrow frequency band centered at the step frequency of the stepped output signal with sharp cutoff of either side of that narrow band. The third section adds the noninverted output of the first section to the inverted output of the second section. This third section has a lead-lag transfer function designed to reduce the phase angle between the signal at its output terminal and the stepped signal at the input of the first section.

Official Gazette of the U.S. Patent and Trademark Office

N82-24418* National Aeronautics and Space Administration. Pasadena Office, Calif.
PULSE SWITCHING FOR HIGH ENERGY LASERS Patent
James B. Laudenslager (JPL, California Inst. of Tech., Pasadena) and Thomas J. Pacala, inventors (to NASA) (JPL, California Inst. of Tech., Pasadena) Issued 23 Jun. 1981 9 p Filed 23 Mar. 1979 Supersedes N79-21336 (17 - 12, p 1561) Sponsored by NASA
(NASA-Case-NPO-14556-1; US-Patent-4,275,317; US-Patent-Appl-SN-023485; US-Patent-Class-307-415; US-Patent-Class-328-67; US-Patent-Class-331-94.5G; US-Patent-Class-331-94.5PE; US-Patent-Class-333-20) Avail: US Patent and Trademark Office CSCL 09C

A saturable inductor switch for compressing the width and sharpening the rise time of high voltage pulses from a relatively slow rise time, high voltage generator to an electric discharge gas laser (EDGL) also provides a capability for efficient energy transfer from a high impedance primary source to an intermediate low impedance laser discharge network. The switch is positioned with respect to a capacitive storage device, such as a coaxial cable, so that when a charge build-up in the storage device

reaches a predetermined level, saturation of the switch inductor releases or switches energy stored in the capactive storage device to the EDGL. Cascaded saturable inductor switches for providing output pulses having rise times of less than ten nanoseconds and a technique for magnetically biasing the saturable inductor switch are disclosed.

Official Gazette of the U.S. Patent and Trademark Office

N82-24419* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

AUTOMATIC THERMAL SWITCH Patent

Lawrence D. Wing and Joseph W. Cunningham, inventors (to NASA) Issued 8 Apr. 1981 9 p Filed 30 May 1979 Supersedes N80-18338 (18 - 09, p 1136)

(NASA-Case-GSC-12415-1; US-Patent-4,281,708; US-Patent-Appl-SN-043943; US-Patent-Class-165-32; US-Patent-Class-62-383) Avail: US Patent and Trademark Office CSCL 09C

An automatic thermal switch to control heat flow includes a first thermally conductive plate, a second thermally conductive plate and a thermal transfer plate pivotally mounted between the first and second plates. A phase change power unit, including a plunger connected to the transfer plate, is in thermal contact with the first thermally conductive plate. A biasing element, connected to the transfer plate, biases the transfer plate in a predetermined position with respect to the first and second plates. When the phase change power unit is actuated by an increase in heat transmitted through the first plate, the plunger extends and pivots the transfer plate to vary the thermal conduction between the first and second plates through the transfer plate. The biasing element, transfer plate and piston can be arranged to provide either a normally closed or normally open thermally conductive path between the first and second plates.

Official Gazette of the U.S. Patent and Trademark Office

N82-24420* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

TEST APPARATUS FOR LOCATING SHORTS DURING ASSEMBLY OF ELECTRICAL BUSES Patent

Gordon J. Deboo and David L. Devine, inventors (to NASA) Issued 8 Apr. 1981 5 p Filed 24 Aug. 1979 Supersedes N79-31498 (17 - 22, p 2946)

(NASA-Case-ARC-11116-1; US-Patent-4,282,479; US-Patent-Appl-SN-069485; US-Patent-Class-324-51; US-Patent-Class-324-52) Avail: US Patent and Trademark Office CSCL 09C

A test apparatus is described for locating electrical shorts that is especially suited for use while an electrical circuit is being fabricated or assembled. A ring counter derives input pulses from a square wave oscillator. The outputs of the counter are fed through transistors to an array of light emitting diodes. Each diode is connected to an electrical conductor, such as a bus bar, that is to be tested. In the absence of a short between the electrical conductors the diodes are sequentially illuminated. When a short occurs, a comparator/multivibrator circuit triggers an alarm and stops the oscillator and the sequential energization of the diodes. The two diodes that remain illuminated identify the electrical conductors that are shorted.

Official Gazette of the U.S. Patent and Trademark Office

N82-24421* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

LINEAR MAGNETIC MOTOR/GENERATOR Patent

Philip A. Studer, inventor (to NASA) Issued 9 Feb. 1982 13 p Filed 7 Feb. 1980 Supersedes N80-19424 (18 - 10, p 1287)

(NASA-Case-GSC-12518-1; US-Patent-4,315,197; US-Patent-Appl-SN-119336; US-Patent-Class-318-135; US-Patent-Class-335-229; US-Patent-Class-335-266; US-Patent-Class-310-12) Avail: US Patent and Trademark Office CSCL 09A

A linear magnetic motor/generator is disclosed which uses magnetic flux to provide mechanical motion or electrical energy. The linear magnetic motor/generator includes an axially movable actuator mechanism. A permament magnet mechanism defines a first magnetic flux path which passes through a first end portion of the actuator mechanism. Another permament magnet mechanism defines a second magnetic flux path which passes through a second end portion of the actuator mechanism. A drive coil defines a third magnetic flux path passing through a third central portion of the actuator mechanism. A drive coil selectively adds magnetic flux to and subtracts magnetic flux from magnetic flux flowing in the first and second magnetic flux path.

Official Gazette of the U.S. Patent and Trademark Office

N82-24422* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

NON-CONTACTING POWER TRANSFER DEVICE Patent

Philip A. Studer and John Paulkovich, inventors (to NASA) Issued 23 Mar. 1982 7 p Filed 13 Nov. 1980 Supersedes N81-12331 (19 - 03, p 0338)

(NASA-Case-GSC-12595-1; US-Patent-4,321,572; US-Patent-Appl-SN-206506; US-Patent-Class-336-83; US-Patent-Class-336-120) Avail: US Patent and Trademark Office CSCL 09A

A transformer for coupling AC electrical energy from a stationary element to a rotating element without the use of sliding contacts is described. The transformer is of the rotary type and includes a ferrite core and two primary windings which are stationary with respect to a seconary winding which rotates within an annular cavity adjacent an axial bore in the core. The core is comprised of two cup type core halves. Electrical connection to the secondary winding is made through a split bobbin assembly which couples to a coaxial shaft assembly located in the axial bore. The electrical coupling to the coaxial shaft assembly is made through a continuous transverse channel connecting the axial bore with the annular cavity. The transverse channel forms a single air gap; however, it is not open directly to free space but is shielded by the magnetic permeable material of the core halves. Official Gazette of U.S. Patent and Trademark Office

N82-24423 Defence Research Information Centre, Orpington (England).

COMPONENTS BASED ON MAGNETO-ELASTIC PHENOMENA

J. Deckert Jan. 1982 46 p refs Transl. into ENGLISH from NTG-Fachber. (West Germany), v. 76, 1980 p 85-108

(DRIC-T-6451; BR82494) Copyright. Avail: Issuing Activity

Magnetoelastic materials and their applications in magnetostrictive oscillators, electromechanical filters and delay lines are discussed. The properties of commercial magnetoelastic materials are tabulated. The performance of magnetostrictive, piezoelectric, and quartz oscillators are compared. The development of low cost quartz and piezoelectric materials reduces the significance of magnetostrictive components. Uses are restricted to springs and diaphragms, e.g. in clocks or control engineering, temperature independent resonators, and vibrational systems.

Author (ESA)

N82-24424*# Department of Energy, Washington, D. C.

DEVELOPMENT OF A DUAL-FIELD HETEROPOPLAR POWER CONVERTER

David B. Eisenhaure, Bruce Johnson, Tim E. Bliamptis, and Emery StGeorge Aug. 1981 68 p refs

(Contract NAS3-20817; DE-AI01-77CS-1044)

(NASA-CR-165168; NAS 1.26:165168; R-1489) Avail: NTIS HC A04/MF A01 CSCL 10B

The design and testing of a 400 watt, dual phase, dual rotor, field modulated inductor alternator is described. The system is designed for use as a flywheel to ac utility line or flywheel to dc bus (electric vehicle) power converter. The machine is unique in that it uses dual rotors and separately controlled fields to produce output current and voltage which are in phase with each other. Having the voltage and current in phase allows the power electronics to be made of simple low cost components. Based on analytical predictions and experimental results, development of a complete 22 kilowatt (30 Hp) power conversion system is recommended. This system would include power electronics and controls and would replace the inductor alternator with an improved electromagnetic conversion system. Author

N82-24425*# Eaton Engineering and Research Center, Southfield, Mich.

STRAIGHT AND CHOPPED DC PERFORMANCE DATA FOR A GENERAL ELECTRIC 5BY436A1 DC SHUNT MOTOR WITH A GENERAL ELECTRIC EV-1 CONTROLLER Final Report

Paul C. Edie Oct. 1981 58 p
(Contract DEN3-123; DE-AI01-77CS-51044)
(NASA-CR-165507; DOE/NASA/0123-4; NAS 1.26:165507; ERC-TR-8186) Avail: NTIS HC A04/MF A01 CSCL 09C

Both straight and chopped dc motor performance data for a General Electric 5BY436A1 motor with a General Electric EV-1 controller is presented in tabular and graphical formats. Effects of motor temperature and operating voltage are also shown. The maximum motor efficiency is approximately 85% at low operating temperatures in the straight dc mode. Chopper efficiency can be assumed to be 95% under all operating conditions. For equal speeds, the motor operated in the chopped mode develops slightly more torque and draws more current than it does in the straight mode. Author

N82-24426*# National Aeronautics and Space Administration. Pasadena Office, Calif.
THIN WIRE POINTING METHOD Patent Application
Gordon Green (JPL, California Inst. of Tech., Pasadena) and Robert J. Mattauch, inventors (to NASA) (JPL, California Inst. of Tech., Pasadena) Filed 17 Nov. 1981 10 p
(Contract NAS7-100)
(NASA-Case-NPO-15789-1; US-Patent-Appl-SN-322316) Avail: NTIS HC A02/MF A01 CSCL 09A

A method is described for forming sharp tips on thin wires, in particular phosphor bronze wires of diameters such as one thousandth inch used to contact micron size Schottky barrier diodes, which enables close control of tip shape and which avoids the use of highly toxic solutions. The method includes dipping and end of a phosphor bronze wire into a dilute solution of sulfamic acid and applying a current through the wire to electrochemically etch it. The humidity in the room is controlled to a level of less than 50%, and the voltage applied between the wire and another electrode in the solution is a half wave rectified voltage. The current through the wire is monitored, and the process is stopped when the current falls to a predetermined low level. NASA

N82-24427*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
DIRECT CURRENT BALLAST CIRCUIT FOR METAL HALIDE LAMP Patent Application
Paul Lutus, inventor (to NASA) (ILC Technology, Inc., Sunnyvale, Calif.) Filed 14 Sep. 1981 14 p Sponsored by NASA
(NASA-Case-MSC-18407-1; US-Patent-Appl-SN-293419) Avail: NTIS HC A02/MF A01 CSCL 09A

A direct current ballast circuit for a two electrode metal halide lamp is described. Said direct current ballast circuit includes a low voltage DC input and a high frequency power amplifier and power transformer for developing a high voltage output. The output voltage is rectified by diodes and filterd by inductor and capacitor to provide a regulated DC output through commutating diodes to one terminal of the lamp at the output terminal. A feedback path from the output of the filter capacitor through the bias resistor to power the high frequency circuit which includes the power amplifier and the power transformer for sustaining circuit operations during low voltage transients on the input DC supply is described. A current sensor connected to the output of the lamp through terminal for stabilizing lamp current following breakdown of the lamp is described. NASA

N82-24428*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
PULSED THYRISTOR TRIGGER CONTROL CIRCUIT Patent Application
Frank J. Nola, inventor (to NASA) Filed 30 Nov. 1981 15 p
(NASA-Case-MFS-25616-1; US-Patent-Appl-SN-325932) Avail: NTIS HC A02/MF A01 CSCL 09C

A trigger control circuit for producing firing pulses for the thyristor of a thyristor control system such as a power factor controller is described. The control circuit overcomes thyristor triggering problems involved with the current lag associated with controlling inductive loads. A phase difference signal is utilized in deriving a signal for inhibiting generation of a firing pulse until no current is flowing from the preceeding half cycle. NASA

N82-24429# Aerospace Corp., El Segundo, Calif. Space Sciences Lab.
AUGUST 1979 LSI STATIC MEMORY TESTS
Wojciech A. Kolasinski 1 May 1981 12 p refs
(Contract F04701-80-C-0081)
(AD-A099438; SD-TR-81-36; TR-0081(6960-05)-16) Avail: NTIS HC A02/MF A01 CSCL 09/3

Several of LSI static RAM's were tested with heavy ions from the Lawrence Berkeley Laboratory 88" Cyclotron. Sufficient data were obtained to make the estimate that the latchup probability due to cosmic rays in space is approximately 0.02 per chip per year, for the MM54C929 RAM. The tests also showed that MWS5501 RAM's are essentially immune to cosmic-ray induced soft errors and latchup. Furthermore, it was found that the commercial version of the HM6508 is susceptible to both latchup and soft errors, while the various rad-hard versions of the same device are immune to cosmic-ray induced latchup and relatively hard against soft errors. Author

N82-24430# Aerospace Corp., El Segundo, Calif. Materials Sciences Lab.
AUTOMATED PARTIAL-DISCHARGE TESTING OF TRAVELING-WAVE TUBES
Kenneth W. Paschen and Francis Hai 1 May 1981 31 p refs
(Contract F04701-80-C-0081)
(AD-A099379; SD-TR-81-38; TR-0081(6950-03)-1) Avail: NTIS HC A03/MF A01 CSCL 09/1

A test system that is used to evaluate the quality of high voltage insulation in traveling wave tubes is described. Evaluation is performed by quantitatively recording the occurrence of partial discharges during temperature cycling in vacuum for extended periods. S.L.

N82-24431*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FIRST RESULTS OF MATERIAL CHARGING IN THE SPACE ENVIRONMENT Interim Report
N. J. Stevens, F. Berkopec, J. Staskus, P. F. Mizera, H. C. Koons, E. R. Schnauss, D. R. Croley, Jr., H. K. Kan (Aerospace Corp.), M. S. Leung (Aerospace Corp.), W. L. Lehn (AFML) et al 15 Mar. 1981 20 p refs Prepared in cooperation with SRI International, Menlo Park, Calif.
(Contract F04701-80-C-0081)
(NASA-TM-84743; NAS 1.15:84743; TOR-0081(6506-1)-1) Avail: NTIS HC A02/MF A01 CSCL 09C

A satellite experiment, designed to measure potential charging of typical thermal control materials at near geosynchronous altitude, was flown as part of the SCATHA program. Direct observations of charging of typical satellite materials in a natural charging event (> 5 keV) are presented. The results show some features which differ significantly from previous laboratory simulations of the environment. S.L.

N82-24432*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
SIMPLIFIED dc TO dc CONVERTER Patent Application
Robert P. Gruber, inventor (to NASA) Filed 14 Apr. 1982 17 p
(NASA-Case-LEW-13495-1; US-Patent-Appl-SN-368188) Avail: NTIS HC A02/MF A01 CSCL 09A

A dc to dc converter is disclosed which has a minimum number of components, output voltage regulation, and output current limiting without any circuits converting the output to any other circuits of the converter. The converter is comprised of a transformer having a primary winding through which current is directed in alternate directions by metal oxide semiconductor transistors connected between the primary winding and a dc source or battery. A secondary winding of the transformer is connected to a rectifying and filter circuit to provide unidirectional output current. Both windings of the transformer are carried on the respective outer legs of an E-core with the center leg of the core proving a leakage reactance. This leakage reactance has the same effect as placing an inductor in series with the rectifiers in output circuit. NASA

N82-24433# Wisconsin Univ. - Madison. Dept. of Electrical and Computer Engineering.

IN-SITU MICROWAVE MEASUREMENTS OF LOSSY DIELECTRICS Final Report, 15 Sep. 1978 - 15 Jan. 1982
R. J. King, C. D. Kim, and J. B. Beyer Jan. 1982 43 p refs Presented at Natl. Radio Sci. Meeting (1979), Seattle, 18-22 Jun. 1981
(Grant DAAG29-78-G-0181)
(AD-A111606; ECE-82-1; ARO-15586.1-GS) Avail: NTIS HC A03/MF A01 CSCL 09/3

The objective of this work has been to develop microwave (4.9 GHz) instrumentation systems, and measurement and inversion techniques for determining the complex dielectric constant of lossy media in-situ. Unique features of this work, compared to other studies, are that the complex propagation constants of traveling waves which are coupled to the medium under test are measured using phase-sensitive homodyne systems. An invasive method was studied wherein a small modulated scattering probe is inserted into a test hole in the medium, and the propagation constant of a spherically expanding wave originating outside the medium is measured. Results are given for portage sand vs moisture content. A non-invasive method uses an open-walled slotted rectangular waveguide laid directly on the surface to couple the traveling wave in the waveguide to the medium. The instrumentation and measurement techniques work quite well and results are given for several media, e.g., rock, concrete, sand, etc. A promising inversion method for finding the dielectric constant is presented, along with suggested improvements in the design of the traveling wave applicator and the detection instrumentation. Author (GRA)

N82-24434# Raytheon Co., Bedford, Mass. Missile Div.
INVESTIGATION OF SILICON CCD DELAY LINES Final Technical Report, 29 Sep. 1978 - 31 Dec. 1980
D. E. Greetham and J. P. Sage Griffiss AFB, N.Y. RADC Jan. 1982 66 p
(Contract F19628-78-C-0167; AF Proj. 2305)
(AD-A111542; RADC-TR-81-274) Avail: NTIS HC A04/MF A01 CSCL 09/5

The primary objectives of this contract include the analysis, design, and development of advanced CCDs with input and output circuitry as well as delay stages capable of operation at 100 MHz and above clock frequency. A high speed 256 stage CCD delay line with high frequency input and output circuits was designed. The device, circuit and process designs adopted emphasize future growth potential such that performance characteristics may be extended to much higher operating frequencies. GRA

N82-24435# RCA Labs., Princeton, N. J.
MONOLITHIC GaAs DUAL-GATE FET PHASE SHIFTER Triannual Report, 1 May - 31 Aug. 1981
M. Kumar, S. N. Subbarao, and R. Menna Sep. 1981 23 p refs
(Contract N00014-79-C-0568)
(AD-A111164; PRRL-81-CR-31; TAR-3; RCA-251-037-Z) Avail: NTIS HC A02/MF A01 CSCL 09/5

The objective of this program is to develop a monolithic GaAs dual-gate FET phase shifter, operating over the 4- to 8-GHz frequency band and capable of a continuously programmable phase shift from 0 deg through N times 360 deg where N is an integer. The phase shift is to be controllable to within +3 deg. This phase shifter will be capable of delivering an output power up to 0 dBm with an input and output VSWR of less than 1.5:1. Progress 1: The photomask of a 0 to 90 deg monolithic GaAs dual-gate FET phase shifter has been procured, and we are in the process of fabricating the phase shifter. 2: We have designed and fabricated a 50 ohm, 4-line interdigitated coupler. Also, we have designed and fabricated a 25-ohm, 6-line interdigitated coupler. The performance of both couplers agrees quite well with the theoretical results. Technical Problems: there was no major problem during this period. GRA

N82-24436# RCA Labs., Princeton, N. J.
EFFECTS OF RADIATION ON OXIDE MATERIALS Final Report, 26 Sep. 1977 - 25 Sep. 1978
Gary W. Hughes and John H. Thomas, III Nov. 1981 91 p refs
(Contract DAAG39-77-C-0159)
(AD-A111149; PRRL-79-CR-12; HDL-CR-79-159-1) Avail: NTIS HC A05/MF A01 CSCL 18/8

Dry and wet (pyrogenic steam)-grown thermal oxides on (100) silicon were made for an investigation of the radiation sensitivity of MOS devices. Oxides were grown under conditions known to produce state-of-the-art hardened oxides as well as very soft oxides. MOS capacitors were fabricated with thin semi-transparent and thick aluminum gates for irradiation with 10.2-eV vacuum ultraviolet (VUV) photons and 1-MeV electrons, respectively. Electrical measurements were made on MOS capacitors to determine trapped-charge density, charge transport, and thermal-trap depth, using high frequency and quasi-static CV, triangular voltage sweep (TVS), and thermally stimulated current (TSC) techniques. TSC measurements taken on irradiated capacitors to characterize the thermal-energy trap spectra gave varied results. Analytical measurements of interface stoichiometry and impurity profiles were done by the use of ion-scattering spectroscopy (ISS), X-ray photoelectron spectroscopy (XPS), and secondary-ion mass spectroscopy (SIMS). GRA

N82-24437# Lincoln Lab., Mass. Inst. of Tech., Lexington.
LARGE-SIGNAL CHARACTERIZATION, AMPLIFIER DESIGN, AND PERFORMANCE OF K-BAND GaAs MESFETS
Carl D. Berglund 11 Dec. 1981 68 p refs
(Contract F19628-80-C-0002; AF Proj. 2487; AF Proj. 2028)
(AD-A110873; TR-586; ESD-TR-81-296) Avail: NTIS HC A04/MF A01 CSCL 09/5

Recent advances in Gallium Arsenide field-effect transistor technology have extended the power amplification capabilities of FETs to K-Band frequency range. FETs with performance capability of 0.5 watt power output at 20 GHz have been developed. Large-signal S-parameter characterizations of these devices have been utilized in designing power and amplifiers. Transistor performance capability is discussed together with the performance of experimental amplifier designs realized in a microstrip environment. GRA

N82-24438# Morgan State Coll., Baltimore, Md. Dept. of Physics.
MOSSBAUER STUDY OF Fe57 IN FeTi AND Fe.8Mn.2Ti HYDRIDES Final Report, 10 Oct. 1980 - 9 Sep. 1981
Frederick Oliver and Windsor Morgan 16 Dec. 1981 12 p refs
(Grant DAAG29-80-G-0003)
(AD-A110755; ARO-17711.1-H-P) Avail: NTIS HC A02/MF A01 CSCL 20/3

This study has been conducted to investigate the effect hydriding has on the electronic and magnetic properties of FeTi and Fe 0.8Mn 0.2Ti using the Mossbauer Effect. Experiments were conducted using the 14.4 kev Mossbauer radiation from Fe57 at temperatures between 4.2 K and 298 K. Studies were made of the changes in isomer shift and linewidth upon hydriding. Our results indicate that hydriding FeTi and Fe 0.8Mn 0.2 Ti causes phase changes in the crystals from an alpha phase to either a beta and/or gamma phase. These studies also indicate that although there is a major change in the pressure composition isotherm upon alloying with manganese, there is no change in the electronic structure of the iron. GRA

N82-24439# Los Alamos Scientific Lab., N. Mex.
MAGNETIC SWITCHES AND CIRCUITS
W. C. Nunnally Sep. 1981 40 p refs
(Contract W-7405-eng-36)
(DE82-001887; LA-8862-MS) Avail: NTIS HC A03/MF A01

The use of saturable inductors as switches in lumped-element, magnetic-pulse compression circuits is discussed. The operation of the three basic types of magnetic pulse compression circuits is discussed and the characteristic use of each is defined. In addition, the geometric constraints and magnetic pulse compression circuits used in short pulse, low inductance systems are considered. The scaling of presaturation leakage currents, magnetic energy losses, and switching times with geometrical and material parameters are developed to aid in evaluating magnetic pulse compression systems in a particular application. Finally, a scheme for increasing the coupling coefficient in saturable stripline transformers is proposed to enable their use in the short pulse, high voltage regime. DOE

N82-24440# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of High Energy.

EFFECT OF LOSSES ON HIGH CURRENT DENSITY SUPERCONDUCTING MAGNET WINDING STABILITY DURING ENERGY REMOVAL PROCESS

V. G. Luppov, D. Kabat, Y. A. Shishov, and V. I. Datskov 1980 8 p refs Submitted for publication
(JINR-E-8-80-165) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

The method of specific losses calculation, as well as of calculation of the temperature rise of the composite superconductor in the time interval from the beginning of the energy removal to the start of the quench under adiabatic conditions was developed in the form of the computer program. Using the computer program the possibility of the quench of a high current density laboratory solenoid during the energy removal due to losses generated in the solenoid winding was shown. The experiments carried out on the laboratory solenoid with a nearly adiabatic insulated winding and storage energy 50 kJ at critical current are in good agreement with calculated results. Both experimental and calculated results nearly demonstrate the independence of the quench magnetic field level of magnetic induction change rate (field decay velocity) at B approximately > 2.5 T/s. It is a function of the composite superconductor properties and initial magnetic induction. DOE

N82-24441# Battelle Pacific Northwest Labs., Richland, Wash.

OBSTACLES AND OPPORTUNITIES IN THE COMMERCIALIZATION OF THE SOLID STATE ELECTRONIC FLUORESCENT LIGHTING BALLAST

Daniel R. Johnson, Alfred A. Marcus, Richard S. Campbell, Paul Sommers, Lisa Skumatz, Bonnie Berk, Phillip Petty, and Catherine Eschbach Oct. 1981 98 p refs
(Contract DE-AC06-76RL-01830)
(DE82-001845; PNL-4035) Avail: NTIS HC A05/MF A01

A solid state ballast (SSB), which improves the efficiency of fluorescent lights, is described. The first generation of solid state electronic ballasts was developed and the technology was transferred to the private sector. The opportunities for rapid dissemination of this technology into the marketplace is examined. Product characteristics and their influence on the commercialization of the SSB, a description of the technology delivery system presently used by the ballast industry, an analysis of the market for SSB, and identification of some high leverage opportunities to accelerate the commercialization process are included. S.L.

N82-24442# Duisburg Univ. (West Germany). Fachgebeit Werkstoffe der Electrotech.

FUNCTION CONTROL AND FAILURE ANALYSIS OF LARGE SCALE INTEGRATED CIRCUITS BY LOCAL QUANTITATIVE DETERMINATION OF IC INTERNAL WAVEFORMS Final Report, Mar. 1981

Eberhard Menzel and Erich Kubalek Bonn Bendesministerium fuer Forschung und Technologie Nov. 1981 144 p refs In GERMAN; ENGLISH summary Sponsored by Bundesministerium fuer Forschung und Technologie
(BMFT-FB-T-81-201; ISSN-0340-7608) Avail: NTIS HC A07/MF A01; Fachinformations-zentrum, Karlsruhe, West Germany DM 30,25

The use of electron beam probing in the nondestructive testing of integrated circuits was assessed and its field of application was extended. The physical limitation of scanning electron microscpe beams is evaluated. A measuring system was developed, optimized and automated, which yields simultaneously 10 psec time resolution, 0.5 mV voltage resolution, and 0.1 micron spatial resolution at 2.5 keV primary electron energy. Measuring system stability, sample throughput, and system handing simplicity of MOS and bipolar devices is improved.
Author (ESA)

N82-24443# European Space Agency, Paris (France).

THE CURRENT SENSING PREAMPLIFIER: DESIGN AND TEST PRINCIPLES

I. Arens (ESTEC, Noordwijk, Netherlands) Oct. 1981 68 p refs
(ESA-STM-221; ISSN-0379-4075) Avail: NTIS HC A04/MF A01

Transfer function and noise spectrum of a preamplifier for high impedance source were investigated theoretically and practically. Theoretically, the equivalent circuit is built up stepwise from the basic configuration to a complex one resembling reality, using computer simulations. The influence of parasitic feedback elements and amplifying element phase shift on bandwidth and stability are considered. A test method yielding the correct transfer function without simulating a high frequency current source is described. Criteria for minimum noise were derived and the corresponding noise spectra were calculated. A circuit diagram and a layout description of the preamplifier are presented as well as test data. Author (ESA)

N82-24444# Miller Communications Systems Ltd., Kanata (Ontario).

FRAME SYNCHRONIZATION IN SATELLITE-SWITCHED TDMA

B. A. Mazur, K. Tiedemann, S. S. Kahal (Carleton Univ., Ontario), and C. R. Carter (McMaster Univ., Hamilton, Canada) Paris ESA Feb. 1981 142 p refs
(Contract ESTEC-4235/80/NL-DG(SC))
(MCS-8021; ESA-CR(P)-1521) Avail: NTIS HC A07/MF A01

Frame synchronization in three abstract network configurations is examined: (1) a large number of low traffic Earth stations distributed among from 4 to 32 spot beam zones; (2) a small number of high traffic Earth stations; and (3) a combination of (1) and (2). A hierarchical open loop synchronization scheme was adopted. The ground segment consists of a unique word detector, frame timing unit, and satellite phase error detector. In the satellite, a circuit corrects the frame clock and broadcasts a unique word beacon. Overall cold start acquisition time is 23 sec. Author (ESA)

N82-24445# Aeritalia S.p.A., Torino (Italy). Gruppo Equipaggiamenti.

CHARACTERIZATION OF ELECTROSTATIC DISCHARGE TRANSIENTS Final Report

G. Gerbi, M. Mensa, and D. Golzio Paris ESA 30 Oct. 1980 144 p refs
(Contract ESTEC-4165/79/NL-JS)
(RCE-2163; ESA-CR(P)-1523) Avail: NTIS HC A07/MF A01

Electrostatic discharges which occur on spacecraft were simulated on Teflon, Mylar and Kapton samples. Electric field emission, magnetic field emission, structure discharge current, and voltage and current coupling on interface circuits were examined. Results show that discharge amplitude is a function of sample size, but the relation is not directly proportional. Teflon has the highest discharge amplitude. Mylar and Kapton have almost the same discharge amplitudes, but Mylar is damaged after 30 min testing. Perforated Kapton does not discharge.
Author (ESA)

N82-24236# Centre National d'Etudes Spatiales, Toulouse (France).

EVALUATION OF CCDS [EVALUATION DES CCD]

G. Rolland *In its* The Technol. of Spaceborne Sci. Expt. 1981 p 617-624 In FRENCH (For primary document see N82-24215 15-12)
Avail: NTIS HC A99/MF A01

N82-24237# Centre National d'Etudes Spatiales, Toulouse (France).

ELECTRONIC COMPONENTS [LES COMPOSANTS ELECTRONIQUES]

F. Linder *In its* The Technol. of Spaceborne Sci. Expt. 1981 p 625-647 refs In FRENCH (For primary document see N82-24215 15-12)
Avail: NTIS HC A99/MF A01

N82-24239# Centre National d'Etudes Spatiales, Toulouse (France).

ASSEMBLY TECHNOLOGY [LES TECHNOLOGIES D'ASSEMBLAGE]

F. Linder *In its* The Technol. of Spaceborne Sci. Expt. 1981 p 659-687 refs In FRENCH (For primary document see N82-24215 15-12)
Avail: NTIS HC A99/MF A01

N82-25110*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

POTENTIAL REDUCTION OF DSN UPLINK ENERGY COST

S. Dolinsky and N. F. deGroot *In its* The Telecommun. and Data Acquisition Rept. 15 Apr. 1982 p 151-166 refs (For primary document see N82-25092 15-99)
Avail: NTIS HC A09/MF A01 CSCL 09C

34 FLUID MECHANICS AND HEAT TRANSFER

Includes boundary layers; hydrodynamics; fluidics; mass transfer; and ablation cooling.

For related information see also *02 Aerodynamics* and *77 Thermodynamics and Statistical Physics*.

N82-24446# Rome Univ. (Italy). Ist. di Aerodinamica.
A LASER DOPPLER METHOD FOR MEASURING OSCILLATING FLOW IN PRISMATIC TANKS
Antonio Cenedese Oct. 1981 27 p refs Backup document for AIAA Synoptic scheduled for publication in AIAA Journal in Dec. 1982
(LOG-J12719) Avail: NTIS HC A03/MF A01

The flow field inside a partially filled prismatic tank with a rectangular section which oscillates laterally was analyzed using a laser Doppler velocimeter. The natural frequencies of the system can be determined with greater accuracy through velocity measurements than through acceleration measurements or flow visualization. Considering the effective value of the horizontal velocity along a vertical line, it is possible to show an out of phase of velocity at different points. This phenomenon, particularly noticeable for the vibration modes of higher order, causes in some points lower RMS values of velocity than those measured near the bottom. The distribution of vertical velocity near the free surface, when the frequency of the acting force is equal to one of the natural frequencies of the liquid tank system, shows that the maxima and the nodes are shifted toward the center of the tank in comparison with the positions computed using the linear theory with the hypothesis of inviscid fluid. B.W.

N82-24447*# Princeton Univ., N. J. Dept. of Mechanical and Aerospace Engineering.
TURBULENCE MEASUREMENTS IN HIGH-SPEED FLOWS BY RESONANT FLUORESENCE Final Report, 1 Jan. 1979 - 31 Dec. 1981
Richard B. Miles May 1982 30 p refs Original contains color illustrations
(Grant NsG-2366)
(NASA-CR-168934; NAS 1.26:168934; MAE-1565) Avail: NTIS HC A03/MF A01 CSCL 20D

Both mean flow and turbulence measurements were investigated using the resonant Doppler velocimeter in a Mach 3.2 nitrogen flow. Data are presented showing velocity, temperature and pressure measured point by point across the flow field. This data is compared with conventional pitot and temperature surveys. Turbulence was induced by a small metal tab in the flow and observed by both hot wire and RDV techniques. Photographs of the flow field demonstrate the utility of the RDV for quantitative flow field visualization. S.L.

N82-24448*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
POWDER FED SHEARED DISPERSAL PARTICLE GENERATOR Patent Application
E. Leon Morrisette and Dennis M. Bushnell, inventors (to NASA) Filed 28 Aug. 1981 11 p
(NASA-Case-LAR-12785-1; US-Patent-Appl-SN-297488) Avail: NTIS HC A02/MF A01 CSCL 20D

A particle generating system is described which is capable of breaking up agglomerations of particles and producing a cloud of uniform, submicron-sized particles at high pressure and high flow rates. This is achieved by utilizing a tubular structure which has injection microslits on its periphery to accept and disperse the desired particle feed. By suppling a carrying fluid at a pressure, of approximately twice the ambient pressure of the velocimeter's settling chamber, the microslits operate at choked flow conditions. The shearing action of this choked flow is sufficient to overcome interparticle bonding forces, thereby breaking up the agglomerates of the particle feed into individual particles. NASA

N82-24449*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
MAGNETIC HEAT PUMPING Patent Application
Gerald V. Brown, inventor (to NASA) Filed 19 Feb. 1981 20 p
(NASA-Case-LEW-12508-3; US-Patent-Appl-SN-235868) Avail: NTIS HC A02/MF A01 CSCL 20D

The method of the invention employs ferromagnetic or ferrimagnetic elements, preferably of rare-earth based material, for example gadolinium, and preferably employs a regenerator. The steps of the method comprise controlling the temperature and applied magnetic field of the element to cause the state of the element as represented on a temperature-magnetic entropy diagram repeatedly to traverse a loop. The loop may have a first portion of concurrent substantially isothermal or constant temperature and increasing applied magnetic field, a second portion of lowering temperature and constant applied magnetic field, a third portion of isothermal and decreasing applied magnetic field, and a fourth portion of increasing temperature and constant applied magnetic field. Other loops may be four-sided, with, for example, two isotherms and two adiabats (constant entropy portions). Preferably, a regenerator may be employed to enhance desired cooling or heating effects, with varied magnetic fields or varying temperatures including three-sided figures traversed by the representative point. NASA

N82-24450*# Imperial Coll. of Science and Technology, London (England). Dept. of Mechanical Engineering.
DEVELOPING FLOW IN S-SHAPED DUCTS. 1: SQUARE CROSS-SECTION DUCT Final Report
A. M. K. P. Taylor, J. H. Whitelaw, and M. Yianneskis May 1982 53 p refs
(Contract NASw-3435)
(NASA-CR-3550; NAS 1.26:3550; FS/81/22) Avail: NTIS HC A04/MF A01 CSCL 20D

Laser-Doppler velocimetry was used to measure the laminar and turbulent flow in an S-duct formed with two 22.5 deg sectors of a bend with ratio of mean radius of curvature to hydraulic diameter of 7.0. The boundary layers at the inlet to the bend were about 25% and 15% of the hydraulic diameter for the laminar and turbulent flows, respectively. Pressure-driven secondary flows develop in the first half of the S-duct and persist into the second half but are largely reversed by the exit plane as a consequence of the change in the sense of curvature. There is, however, a region near the outer wall of the second bend where the redistribution of the streamwise isotachs results in a reinforcement of the secondary flow which was established in the first half of the S-duct. The net redistribution of the streamwise isotachs is comparable to that occurring in unidirectional bends of stronger curvature. The wall pressure distribution was also measured for the turbulent flow and quantifies the expected large variations in the longitudinal pressure gradient distributions which occur at different radial locations. M.G.

N82-24451*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
COMPUTATION OF INCOMPRESSIBLE, THREE-DIMENSIONAL TURBULENT BOUNDARY LAYERS AND COMPARISON WITH EXPERIMENT
U. R. Mueller May 1982 28 p refs
(NASA-TM-84230; A-8873; NAS 1.15:84230) Avail: NTIS HC A03/MF A01 CSCL 20D

Incompressible three dimensional, turbulent boundary layer (3DTBL) experiments were simulated numerically by integrating the boundary layer equations together with an algebraic eddy viscosity turbulence model. For the flow treated, the downstream portion, where the crossflow was large, was not predicted with the present computational method; the flow was significantly influenced by elliptic flow field effects. Departures from the boundary layer concept are indicated. Calculations agreed reasonably well with the mean flow development up to separation. In one experiment the normal pressure gradients were found to be neligible in regions with large skewing and allowed testing turbulence models using the boundary layer equations. The simulation of this flow compared favorably with the experimental

data throughout the flow field and suggested the applicability of algebraic eddy viscosity models for 3DTBLs. Author

N82-24452*# Southwest Research Inst., San Antonio, Tex.
STUDY OF VAPOR FLOW INTO A CAPILLARY ACQUISITION DEVICE Final Report
Franklin T. Dodge and Edgar B. Bowles Apr. 1982 64 p refs
(Contract NAS3-22664)
(NASA-CR-167883; NAS 1.26:167883; SuRI02-6369) Avail: NTIS HC A04/MF A01 CSCL 20D

An analytical model was developed that prescribes the conditions for vapor flow through the window screen of a start basket. Several original submodels were developed as part of this model. The submodels interrelate such phenomena as the effect of internal evaporation of the liquid, the bubble point change of a screen in the presence of wicking, the conditions for drying out of a screen through a combination of evaporation and pressure difference, the vapor inflow rate across a wet screen as a function of pressure difference, and the effect on wicking of a difference between the static pressure of the liquid reservoir and the surrounding vapor. Most of these interrelations were verified by a series of separate effects tests, which were also used to determine certain empirical constants in the models. The equations of the model were solved numerically for typical start basket designs, and a simplified start basket was constructed to verify the predictions, using both volatile and nonvolatile test liquids. The test results verified the trends predicted by the model. S.L.

N82-24453*# Stanford Univ., Calif. Dept. of Aeronautics and Astronautics.
INVESTIGATION OF LASER-INDUCED IODINE FLUORESCENCE FOR THE MEASUREMENT OF DENSITY IN COMPRESSIBLE FLOWS
James Carter McDaniel, Jr. Jan. 1982 139 p refs
(Grant NAG2-36; Contract F49620-80-C-0091)
(NASA-CR-168965; NAS 1.26:168965; SU-SUDAAR-532) Avail: NTIS HC A07/MF A01 CSCL 20D

Laser induced fluorescence is an attractive nonintrusive approach for measuring molecular number density in compressible flows although this technique does not produce a signal that is directly related to the number density. Saturation and frequency detuned excitation are explored as means for minimizing the quenching effect using iodine as the molecular system because of its convenient absorption spectrum. Saturation experiments indicate that with available continuous wave laser sources of Gaussian transverse intensity distribution only partial saturation could be achieved in iodine at the pressures of interest in gas dynamics. Using a fluorescence lineshape theory, it is shown that for sufficiently large detuning of a narrow bandwidth laser from a molecular transition, the quenching can be cancelled by collisional broadening over a large range of pressures and temperatures. Experimental data obtained in a Mach 4.3 underexpanded jet of nitrogen seeded with iodine for various single mode argon laser detunings from a strong iodine transition at 5145 A are discussed. A.R.H.

N82-24454*# Stanford Univ., Calif. Dept. of Aeronautics and Astronautics.
DENSITY MEASUREMENT IN AIR WITH A SATURABLE ABSORBING SEED GAS Semiannual Progress Report, 1 Jul. - 31 Dec. 1981
Donald Baganoff Apr. 1982 14 p refs
(Contract NCC2-50; Grant NAG2-36; Contract F49620-80-0091)
(NASA-CR-168966; NAS 1.26:168966; Aero-35-82) Avail: NTIS HC A02/MF A01 CSCL 20D

A method for making density measurements in a compressible flow by using off resonance laser induced fluorescence is studied. The seed molecule chosen for study is the iodine molecule which is excited with the 514.5 nm line of the argon ion laser whose output is frequency tuned, by as much as 3 GHz, relative to a strong iodine transition using an intracavity etalon. The theory which was developed to analyze the effect will be used in conjunction with two experiments being conducted to further study the method an acoustic resonance tube in which controlled perturbations about a uniform state are produced, and a small supersonic jet in which the conditions of the flow vary widely from point to point. B.W.

N82-24455*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FLOWS THROUGH SEQUENTIAL ORIFICES WITH HEATED SPACER RESERVOIRS
R. C. Hendricks and T. Trent Stetz (Miami Univ., Oxford, Ohio) 1982 13 p refs Presented at the 9th Intern. Cryogenics Eng. Conf./Intern. Cryogenic Mater. Conf., Kobe, Japan, 11-14 May 1982
(NASA-TM-82855; E-1224; NAS 1.15:82855) Avail: NTIS HC A02/MF A01 CSCL 20D

Flow rates and pressure thermal profiles for two phase choked flows of fluid nitrogen were studied theoretically and experimentally in a four sequential orifice configuration. Both theory and experimental evidence demonstrate that heat addition in the first spacer-reservoir adjacent to the inlet orifice is most effective in reducing the flow rate and that heat addition in the last spacer-reservoir is least effective. The flows are choked at the exit orifice for large spacings and at the inlet orifice for small spacings. The moderate addition of heat available for this experiment did not materially alter this result for large spacings; however, significant heat addition for the small spacings tended to shift the choke point to the exit orifice. Nitrogen is used as the working fluid over a range of states from liquid to gas with a reduced inlet stagnation pressure range to P sub r, o = 2. Author

N82-24456# Texas Univ. at Arlington. Fluid Dynamics Inst.
UNSTEADY WALL-PRESSURE MEASUREMENTS FOR UNDEREXPANDED NOZZLES EXHAUSTING INTO LAUNCH TUBES
Stanley A. Bouslog, Ed. J. Zihlman, Jr., and John J. Bertin Redstone Arsenal, Ala. Army Missile Command Jan. 1982 50 p refs
(Contracts DAAH01-80-C-0118; DAAH01-81-C-B078)
(AD-A111709; Rept-81-105) Avail: NTIS HC A03/MF A01 CSCL 20/4

An experimental program was conducted using transducers capable of measuring the unsteady pressures acting on the launcher wall for a nozzle-exit-location of 8.0h. At this position, the exhaust flow impinges on the launcher wall upstream of the ring but close enough to the ring to generate significant blow-by flow. The most interesting finding of the investigation was the transient characteristics of the flow initiation. As the rocket motor comes up to pressure (i.e., as the stagnation pressure increases toward its 'steady-state' (value), large negative gage pressures exist on the wall. Thus, at the instant of ignition, the system acts as an ejector. Hence, because the wall pressure in this region (which serves as the base pressure) is relatively low, the flow tends to expand through a relatively large angle. This initial expansion angle is larger than the 'steady-state' angle. Thus, the initial impingement shock is probably stronger than the corresponding steady-state condition. The flow then oscillates until reaching the appropriate steady state value. Transient behavior similar to this has been observed in several of the flight-test programs, that have been studied by personnel from the University of Texas at Austin. GRA

N82-24457# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Aerospace and Ocean Engineering.
COMPUTATION OF THREE-DIMENSIONAL VISCOUS FLOW OVER BLUNT LIFTING BODIES AT HIGH ANGLE OF ATTACK
K. Y. Szema and C. H. Lewis 14 May 1981 26 p refs
(AD-A111790) Avail: NTIS HC A03/MF A01 CSCL 20/4

The viscous shock-layer equations for three-dimensional hypersonic flows of a perfect gas or equilibrium air over lifting bodies at high angles of attack have been developed. For the complex three-dimensional reentry vehicle geometries of interest, the resulting equations are written in a nonorthogonal, body-oriented coordinate system, and the three velocity components are defined in the nonorthogonal coordinate directions. Since the viscous shock-layer governing equations are parabolic in both the stream-wise and crossflow directions, the equations are solved by a highly efficient finite-difference scheme. The principal advantages of this technique are the numerical method

can be used to predict the flowfield about arbitrary geometries in both subsonic and supersonic regions, the solution is direct, and the effects of inviscid-viscous interactions are uniformly valid throughout the shock layer. Numerical solutions have been obtained for a 1:1.4 (perfect gas), 1:2 ellipsoid in a perfect gas or equilibrium air and the nose portion of the shuttle orbiter at zero, 10 and 25 deg angles of attack. Comparisons were made with inviscid solutions and existing experimental data, and the agreement is good for all the cases. Author (GRA)

N82-24458# Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Aerospace and Ocean Engineering.
THREE-DIMENSIONAL VISCOUS SHOCK-LAYER ANALYSIS OF LAMINAR OR TURBULENT FLOWS IN CHEMICAL EQUILIBRIUM
B. Denysyk 14 May 1981 40 p refs
(AD-A111792) Avail: NTIS HC A03/MF A01 CSCL 20/4

Three dimensional hypersonic laminar or turbulent shock layer flows for perfect gas or equilibrium air are predicted. A two layer eddy viscosity model is used for the turbulent regime. The thermodynamic and transport properties for air are obtained by interpolation within a two dimensional stable or from curve fit data. Comparisons are made for air in chemical equilibrium and perfect gas for a seven degree half angle spherically blunted cone at various flight altitudes with a cold, moderately cool and an adiabatic wall for angles of attack up to twenty degrees. Wall heat transfer, wall pressure, force and moment coefficients and execution times are compared for some sample cases. This method is used to predict viscous flow in chemical equilibrium over axisymmetric reentry vehicles at angles of attack up to 25 degrees. DOE

N82-24459# Dayton Univ., Ohio. Research Inst.
DISCRETIZATION ERRORS IN THE FAR FIELD CONDITIONS FOR OSCILLATORY SUBSONIC FLOWS Final Report, Jun. - Dec. 1981
Karl G. Guderley Wright-Patterson AFB, Ohio AFWAL Dec. 1981 74 p refs
(Grant AF-AFOSR-3524-78; AF Proj. 2304)
(AD-A110995; UDR-TR-81-50; AFWAL-TR-81-3150) Avail: NTIS HC A04/MF A01 CSCL 20/4

The effects of a discretization carried out in the partial differential equation for different formulations of the far field conditions are illustrated. The far field conditions are established by the infinite matrices. The appearance of these matrices depends upon the choice of the 'test' functions used in formulating the far field conditions, but the relations obtained for different formulations arise from each other by premultiplication with some matrix. In a numerical approach an approximation of the potential and its normal derivative in terms of a finite number of parameters must be used, the vector is restricted to a finite dimensional subspace. The matrices encountered in formulating the far field conditions depend upon the choice of the subspace and of the relative eigenvectors and eigenvalues of the two matrices. For vectors in an infinite vector space they are independent of the choice of the test functions. The effect of the discretization can be recognized by the deviation of the eigenvectors and eigenvalues from the ideal case. GRA

N82-24460# Kernforschungszentrum, Karlsruhe (West Germany). Hauptabteilung Ingenieurtechnik.
LIQUID DAMPING OF THE STATOR VIBRATIONS AT THE TRUE MASS FLOW METER 50, A MASS FLOW MEASURING INSTRUMENT FOR NON-STEADY-STATE TWO-PHASE FLOW
K. Hain, F. Bruederle, W. Butzer, F. Schloss, and T. Vollmer Sep. 1980 48 p In GERMAN; ENGLISH summary
(KFK-3031; ISSN-0303-4003) Avail: NTIS (US Sales Only) HC A03/MF A01; DOE Depository Libraries

The liquid damping system used in the TMFM 50 True Mass Flowmeter for damping the stator vibrations excited by the two-phase mixture is reviewed from performance and theoretical points of view. The results furnished by a computer code elaborated for parameter studies are compared with that obtained in a series of vibrations tests on original components. The TMFM 50, nominal range of measurement 50 kg/s, is suitable for direct measurement of the two-phase mass flow under transient PWR conditions. DOE

N82-24461# North Carolina State Univ., Raleigh. Dept. of Mechanical and Aerospace Engineering.
EARTH-COUPLED HEAT PUMP Final Report, 1 Jul. 1979 - 30 Sep. 1980
J. A. Edwards 30 Aug. 1981 41 p refs
(DE82-900583; NCEI-0033) Avail: NTIS HC A03/MF A01

The object of the research work was to demonstrate that a water source heat pump could be used with an earth-coupled heat exchanger which was buried in an absorption field of a domestic sewage disposal system to provide the heating and cooling requirements for residential use in an energy efficient fashion. The system consists of a 3 ton heat pump (nominal rating of 34,000 Btu/hr), a closed-loop heat exchanger which was fabricated from 200 feet of 2 inch diameter cast iron soil pipe, and a calorimeter house which had heat transmission characteristics similar to a 100 sq ft house. The earth-coupled heat exchanger was connected to the water side heat exchanger of the heat pump. Water was circulated through the heat exchanger coil in the earth and through the water side heat exchanger of the heat pump. The earth served as the energy source (for heating) or sink (for cooling) for the heat pump. DOE

N82-24462# California Univ., Berkeley. Lawrence Berkeley Lab. Earth Sciences Div.
HEAT TRANSFER IN POROUS MEDIA WITH FLUID PHASE CHANGES Ph.D. Thesis
Ho-Jeen Su Jun. 1981 111 p refs
(Contract W-7405-eng-48)
(DE82-001014; LBL-13187) Avail: NTIS HC A06/MF A01

A one-dimensional experimental apparatus was built to study the heat pipe phenomenon. Basically, it consists of a 25 cm long, 2.5 cm I.D. Lexane tube packed with Ottawa sand. The two ends of the tube were subjected to different temperatures, i.e., one above the boiling temperature and the other below. The tube was well insulated so that a uniform one-dimensional heat flux could pass through the sand pack. Presence of the heat pipe phenomenon was confirmed by the temperature and saturation profiles of the sand pack at the final steady state condition. A one-dimensional steady state theory to describe the experiment was developed which shows the functional dependence of the heat pipe phenomenon on liquid saturation gradient, capillary pressure, permeability, fluid viscosity, latent heat, heat flux and gravity. Influence of the heat pipe phenomenon on wellbore heat losses was studied by use of a two-phase two-dimensional cylindrical coordinate computer model. DOE

N82-24463# California Univ., Berkeley. Lawrence Berkeley Lab. Earth Sciences Div.
NON-EQUILIBRIUM AND EQUILIBRIUM SORPTION WITH A LINEAR-SORPTION ISOTHERM DURING MASS TRANSPORT THROUGH AN INFINITE, POROUS MEDIUM: SOME ANALYTICAL SOLUTIONS
Chalon L. Carnahan and Janet S. Remer Apr. 1981 73 p refs
(Contract W-7405-eng-48)
(DE82-003905; LBL-13005) Avail: NTIS HC A04/MF A01

Solutions were developed for the problem of solute transport in a steady, three dimensional field of groundwater flow with non-equilibrium mass transfer of a radioactive species between fluid and solid phases and with anisotropic hydrodynamic dispersion. Interphase mass transport is described by a linear rate expression. Solutions are presented also for the case of equilibrium distribution of solute between fluid and solid phases. Three types of release from a point source are considered: instantaneous release of a finitie mass of solute, continuous release at an exponentially decaying rate, and release for a finite period of time. Graphical displays of computational results for point-source solutions show the expected variation of sorptive retardation effects progressing from the case of no sorption, through several cases of non-equilibrium sorption, to the case of equilibrium sorption. DOE

N82-24464# California Univ., Berkeley. Lawrence Berkeley Lab. Energy and Environment Div.
EXPERIMENTAL STUDY OF A CHEMICALLY REACTING TURBULENT BOUNDARY LAYER Ph.D. Thesis
Tsun-Ming Terry Ng Sep. 1981 141 p refs
(Contracts W-7405-eng-48; F49620-80-C-0065)

(DE82-001970; LBL-13325) Avail: NTIS HC A07/MF A01

Effects of a strong stepwise temperature rise and exothermic chemical reaction on the turbulent boundary layer over a flat plate were studied. For the reacting flow, ethylene air mixture with equivalent ratio of 0.35 was used. High speed Schlieren photography was used for visualization of the boundary layer thermal structures. Mean and rms density distributions were obtained from Rayleigh scattering intensity measurements. Mean and rms velocity distribution and some important fluctuation correlations were derived from single component laser Doppler velocimetry measurements. Strong wall heating causes the expansion of the heat affected region near the surface and pushes the rest of the boundary layer upwards. The boundary layer thickness, the displacement thickness, the momentum thickness, and the friction coefficient are increased by the wall heating. The Reynolds stress is reduced due to the density decrease.

DOE

N82-24465# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).

EVAPORATION SHOCK WAVES IN RETROGRADE FLUIDS [VERDAMPFUNGSWELLEN IN RETROGRADEN FLUESSIGKEITEN]

Humberto Chaves May 1981 85 p refs In GERMAN (MPIS-7/1981; ISSN-0436-1199) Avail: NTIS HC A05/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 20.40

The spontaneous phase transition from fluid to vapor in retrograde substances under adiabatic conditions was experimentally investigated, with emphasis on the existence of evaporation shock waves. Results show that evaporation shock waves are possible in a channel with constant cross section, filled with a retrograde fluid and that they are nonequilibrium phenomena, dominated by nucleation and bubble growth. Since nucleation theory does not give the number of nuclei and the interaction between nuclei, a comparison is only made between experiment and a phenomenological thermodynamic model clarifying the phenomena of wave disintegration and the formation of evaporation shock waves. Concentrated evaporation shock waves appear if the initial conditions are close to the critical point.

Author (ESA)

N82-24466# Imperial Coll. of Science and Technology, London (England). Computational Fluid Dynamics Unit.

PREDICTIONS OF COMPLEX TURBULENT FLOWS USING THE PHOENICS COMPUTER CODE

A. M. Abdelmeguid, S. Y. Goh, J. Ilegbusi, and D. B. Spalding Sep. 1981 40 p refs Presented at 1980/81 AFOSR-HTTM-Stanford Conf. on Complex Turbulent Flows

(HTS/81/12) Avail: NTIS HC A03/MF A01

A flow simulating computer code was used to predict steady and incompressible turbulent flows in flat plate boundary layers, conical diffusers, a backward facing step, and a curved rectangular duct. Flow was two-dimensional parabolic, two-dimensional elliptic or three-dimensional partially parabolic. The constants in the standard high Reynolds number k-epsilon turbulence model incorporated in the computer code were not adjusted. Agreement with measured data is good for the boundary layers, moderate for the duct flow and uncertain for the sudden enlargement.

Author (ESA)

N82-24467# Imperial Coll. of Science and Technology, London (England). Computational Fluid Dynamics Unit.

NUMERICAL MODELLING OF TWO-DIMENSIONAL SHALLOW-WATER FLOWS Ph.D. Thesis - London Univ.

Sami A. Al-Sanea Oct. 1981 172 p refs

(CFD/82/6) Avail: NTIS HC A08/MF A01

A model which predicts steady, two-dimensional, and homogeneous flow is described. The elliptic governing nonlinear, depth averaged differential equations are solved in a fixed and staggered Cartesian coordinate system, using a finite difference iterative procedure. The hydrodynamic variables are solved by a point by point implicit scheme over the entire flow domain and the depth by a two-dimensional linear equation. The free-surface position and velocities are obtained after successive corrections based on conservation laws. The model applies no restriction on the value of Froude number. In the computational scheme, upstream values of depth are used when evaluating fluxes across the cell faces. Depth variation is accounted for in the depth correction equation. Surface elevations are retained in the convective terms, improving accuracy at moderate and high Froude numbers. Measurements of supercritical flow and supercritical flow with hydraulic jumps in open channels validate the model.

Author (ESA)

N82-24468# Technische Hogeschool, Delft (Netherlands). Lab. for Measurements and Control.

ON THE DYNAMICS OF HYDRAULIC LINES SUPPLYING SERVOSYSTEMS Ph.D. Thesis

A. A. Ham Jan. 1982 154 p refs

(WTHD-141) Avail: NTIS HC A08/MF A01

Measures for achieving an almost quiescent state of hydraulic power supply pressure are outlined. Models for hydraulic pipelines supplying hydraulic control systems, which integrate dynamic behavior of the pipelines, the pressure control valve, or pressure controlled variable displacement pump, gas accumulators, and Helmholtz resonators are developed. Experiments show that pressure fluctuations due to pump flow pulsations are suppressed by a selective filter or by a small gas accumulator. Helmholtz resonator is most effective for eliminating one specific frequency of pump flow pulsation. A gas accumulator close to the pump suppresses pulsations in a wide frequency range. Pressure fluctuations due to the varying servomotor oil consumption are suppressed by an accumulator near the servovalve. Author (ESA)

N82-24469# European Space Agency, Paris (France).

HELIUM 2 COOLING SYSTEMS WITH LONG SERVICE LIVE FOR SPACE USE: PHASE SEPARATION HYBRID COOLING SYSTEMS

G. Klipping, I. Klipping, and U. Schmidtchen Mar. 1982 47 p refs Transl. into ENGLISH from "Helium-II-Kuehlsystem mit langen Srandzeiten fuer Weltraumanwendungen. Phasentrennung, Hybrid-Kuehlystem", Freie Univ. (Berlin) Sep. 80

(ESA-TT-721) Avail: NTIS HC A03/MF A01

Phase separation in zero gravity is discussed and the active phase separator for a liquid helium cooled infrared observatory for Spacelab is described. For long-term (more than one year) applications, a hybrid cooling system is required in which refrigerants boiling at higher temperatures are employed. The suitability of hydrogen and neon are investigated as well as that of a secondary solid refrigerant. Analysis indicates that such a hybrid cooling system, using solid neon, can be realized and has substantial advantages compared with a one-stage He2 cooling system.

Author (ESA)

N82-24908# Stanford Univ., Calif. Dept. of Applied Physics.

COHERENT ANTI-STOKES RAMAN SPECTROSCOPY (CARS) IN A PULSED MOLECULAR BEAM

R. L. Byer, M. D. Duncan, F. Koenig, and P. Oesterlin *In* Innsbruck Univ. Symp. on Automic and Surface Phys., 1982 Contrib. 1982 p 168-171 refs (For primary document see N82-24880 15-70)

Avail: NTIS HC A16/MF A01

N82-24228# Centre National d'Etudes Spatiales, Toulouse (France).

THERMAL CONTROL OF SPACEBORNE EXPERIMENTS [LE CONTROLE THERMIQUE DES EXPERIENCES SPATIALES]

A. Rolfo *In its* The Technol. of Spaceborne Sci. Expt. 1981 p 419-433 refs In FRENCH (For primary document see N82-24215 15-12)

Avail: NTIS HC A99/MF A01

N82-25119 Bell Aerospace Co., Buffalo, N. Y. Textron Div.

TRANSIENT BEHAVIOR OF LIQUID IN AN AXIALLY VIBRATED TANK

Thomas M. Ferger *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 1 May 1981 p 83-96 refs (For primary document see N82-25112 15-99)

Copyright. Avail: NTIS HC $60.50/MF $60.50 CSCL 20/4

N82-25153*# Louisiana State Univ. and A&M Coll., Baton Rouge. Dept. of Mechanical Engineering.

THE DEFLECTION OF A JET BY CONFINING SURFACES

G. D. Catalano, J. B. Morton, and R. R. Humphris *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 2 May 1981 p 49-66 refs Sponsored in part by NSF Prepared in cooperation with

Virginia Univ., Charlottesville (For primary document see N82-25149 15-99)
(Grant NGR-47-005-219)
Avail: NTIS HC $60.50/MF $60.50 CSCL 20D

35 INSTRUMENTATION AND PHOTOGRAPHY

Includes remote sensors; measuring instruments and gages; detectors; cameras and photographic supplies; and holography.

For aerial photography see *43 Earth Resources*. For related information see also *06 Aircraft Instrumentation*, and *19 Spacecraft Instrumentation*.

N82-24470* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
HOT FOIL TRANSDUCER SKIN FRICTION SENSOR Patent
Thomas Vranas, inventor (to NASA) Issued 23 Feb. 1982 6 p Filed 14 Aug. 1980 Supersedes N81-12390 (19 - 03, p 0347)
(NASA-Case-LAR-12321-1; US-Patent-4,317,102; US-Patent-Appl-SN-178195; US-Patent-Class-338-25; US-Patent-Class-29-613; US-Patent-Class-338-275; US-Patent-Class-338-28) Avail: US Patent and Trademark Office CSCL 14B

The device utilizes foil transducers with only one edge exposed to the fluid flow. The surfaces are polished producing a foil transducer that does not generate turbulence while sufficiently thick to carry the required electrical current for high temperature fluid flow. The assembly utilizes a precut layered metal sandwich with attached electrodes eliminating a need for welding and individual sensor celibration.

Official Gazette of the U.S. Patent and Trademark Office

N82-24471* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
INORGANIC SPARK CHAMBER FRAME AND METHOD OF MAKING THE SAME Patent
Thomas M. Heslin, inventor (to NASA) Issued 13 Apr. 1982 9 p Filed 7 Mar. 1980 Supersedes N80-20565 (18 - 11, p 1420)
(NASA-Case-GSC-12354-1; US-Patent-4,325,001; US-Patent-Appl-SN-128229; US-Patent-Class-313-348; US-Patent-Class-250-385; US-Patent-Class-250-386; US-Patent-Class-250-389; US-Patent-Class-313-93; US-Patent-Class-29-25.14) Avail: US Patent and Trademark Office CSCL 14B

A spark chamber frame, manufactured using only inorganic materials is described. The spark chamber frame includes a plurality of beams formed from inorganic material, such as ceramic or glass, and are connected together at ends with inorganic bonding material having substantially the same thermal expansion as the beam material. A plurality of wires formed from an inorganic composition are positioned between opposed beams so that the wires are uniformly spaced and form a grid. A plurality of hold down straps are formed of inorganic material such as ceramic or glass having substantially the same chemical and thermal properties as the beam material. Hold down straps overlie wires extending over the beams and are bonded thereto with inorganic bonding material.

Official Gazette of the U.S. Patent and Trademark Office

N82-24472*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
THERMAL MONITORING, MEASUREMENT, AND CONTROL SYSTEM FOR A VOLATILE CONDENSABLE MATERIALS (VCM) TEST APPARATUS
R. E. Ives Apr. 1982 33 p refs
(NASA-TM-82471; NAS 1.15:82471) Avail: NTIS HC A03/MF A01 CSCL 14B

A thermal monitoring and control concept is described for a volatile condensable materials (VCM) test apparatus where electric resistance heaters are employed. The technique is computer based, but requires only proportioning ON/OFF relay control signals supplied through a programmable scanner and simple quadrac power controllers. System uniqueness is derived from automatic temperature measurements and the averaging of these measurements in discrete overlapping temperature zones. Overall control tolerance proves to be better than + or - 0.5 C from room ambient temperature to 150 C. Using precisely calibrated thermocouples, the method provides excellent temperature control of a small copper VCM heating plate at 125 + or - 0.2 C over a 24 hr test period. For purposes of unattended operation, the programmable computer/controller provides a continual data printout of system operation. Real time operator command is also provided for, as is automatic shutdown of the system and operator alarm in the event of malfunction. B.W.

N82-24473*# National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Center, Edwards, Calif.
INFLATABLE DEVICE FOR INSTALLING STRAIN GAGE BRIDGES Patent Application
Clarence Cook, Glynn Smith, and Richard Monaghan, inventors (to NASA) Filed 17 Nov. 1981 15 p
(NASA-Case-FRC-11068-1; US-Patent-Appl-SN-322314) Avail: NTIS HC A02/MF A01 CSCL 14B

A method and a device are disclosed for pneumatically forcing strain gages into seated engagement with the internal surfaces of a tubular shaft in an installation of multiple strain gages in a tubular shaft. The strain gages or other electronic devices are seated in a template-like component which is wrapped about a pneumatically expansible body. The component is then inserted into a shaft and the body is expanded penumatically. A suitable adhesive is applied to the surfaces. NASA

N82-24474*# National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Center, Edwards, Calif.
ADAPTER FOR MOUNTING MICROPHONE FLUSH WITH THE EXTERNAL SURFACE OF THE SKIN OF A PRESSURIZED AIRCRAFT Patent Application
Robert B. Cohn, inventor (to NASA) Filed 14 Dec. 1981 14 p
(NASA-Case-FRC-11072-1; US-Patent-Appl-SN-330613) Avail: NTIS HC A02/MF A01 CSCL 14B

A mounting device for securing a microphone pick-up head flush with respect to the external surfaces of the skin of an aircraft for detecting shock waves is described. The mount includes a sleeve mounted internally of the aircraft for capturing and supporting an electronics package having the microphone pick-up head attached such that the head is flush with the external surface of the aircraft skin and a pressure seal is established between the internal and external surfaces of the aircraft skin. NASA

N82-24475*# National Aeronautics and Space Administration. Pasadena Office, Calif.
ACOUSTIC ROTATION CONTROL Patent Application
Daniel D. Elleman (JPL, California Inst. of Tech., Pasadena), Arvid P. Croonquist (JPL, California Inst. of Tech., Pasadena), and Taylor G. Wang, Inventors (to NASA) (JPL, California Inst. of Tech., Pasadena) Filed 15 Mar. 1982 14 p
(Contract NAS7-100)
(NASA-Case-NPO-15689-1; US-Patent-Appl-SN-358089) Avail: NTIS HC A02/MF A01 CSCL 14B

A system is described for acoustically controlled rotation of a levitated object, which avoids deformation of a levitated liquid object. Acoustic waves of the same wavelength are directed along perpendicular directions across the object, and with the relative phases of the acoustic waves repeatedly switched so that one wave alternately leads and lags the other by 90 deg. The amount of torque for rotating the object, and the direction of rotation, are controlled by controlling the proportion of time one wave leads the other and selecting which wave leads the other most of the time. NASA

N82-24476*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A PLAN FOR THE CHARACTERIZATION, CALIBRATION, AND EVALUATION OF LAPR-2
James R. Irons, James C. Smith, Lamdin R. Blaine, and Mitchell W. Finkel Mar. 1982 17 p ref

(NASA-TM-83915; NAS 1.15:83915) Avail: NTIS HC A02/MF A01 CSCL 14B

A new airborne Linear Array Pushbroom Radiometer (LAPR-II) was built. LAPR-II will use linear arrays of silicon detectors to acquire four channels of digital image data for spectral bands within the visible and near infrared portions of the spectrum (0.4 - 1.0 micrometers). The data will be quantized to 10 bits, and spectral filters for each channel will be changeable in flight. The instrument will initially be flown aboard a NASA/Wallops' aircraft, and off nadir pointing of LAPR-II will be possible. Together, the instrument and its platform will provide a flexible readily available source of digital image data for scientific experiments. If LAPR-II is to serve as a precise scientific instrument, the instrument's characteristics must be quantitatively described and the data must be calibrated with respect to absolute radiometric units. The LAPR-II is described and the work required to characterize the instrument's spectral response, radiometric response, and spatial resolution and to calibrate the response from the many detectors per array is outlined. Author

N82-24477*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

USE OF A VARIABLE EXPOSURE PHOTOGRAPHIC PYROMETER TO MEASURE SURFACE TEMPERATURES ON A HEMISPHERICAL-FACE MODEL

Andronicos G. Kantsios, William C. Henley, Jr., and Walter L. Snow Apr. 1982 26 p refs

(NASA-TM-83237; NAS 1.15:83237) Avail: NTIS HC A03/MF A01 CSCL 14B

The use of a photographic pyrometer for nonintrusive measurement of high temperature surfaces in a wind tunnel test is described. The advantages of the pyrometer for measuring surfaces whose unique shape makes use of thermocouples difficult are pointed out. The use of computer operated densitometers or optical processors for the data reduction is recommended. J.D.

N82-24478# Japan Atomic Energy Research Inst., Tokyo.

CHARACTERISTICS OF A PARALLEL PLATE AVALANCHE COUNTER WITH THIN FILM ELECTRODES

K. Tsumaki, F. Fukuzawa, and E. Takekoshi Jun. 1980 19 p refs In JAPANESE

(JAERI-M-8884) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

A small sized parallel plate avalanche counter (PPAC) consisting of 30 SIGMA g/sq cm polypropylene stretched film was made, and its characteristics as a time sensitive detector were examined with alpha particles from an Am-241 source. The correlation was obtained between breakdown voltage of PPAC and Townsend primary ionization coefficient and between pulse height distribution of avalanche electrons and time resolution as a function of the gas pressure. A relay circuit to minimize the damage of PPAC in breakdown of the gas was set, and its effectiveness was confirmed. DOE

N82-24479# McElroy (Ralph) Co., Austin, Tex.

DETECTORS USING SECONDARY EMISSION RESULTS: ANTICIPATED DEVELOPMENTS ON SATURN 2 SURFACES

R. Perret 1981 17 p refs Transl. into ENGLISH "Detecteurs a emission secondaire resultants: Developpements prevus sur les aires de Saturne 2" CEA, Inst. National de Physique Nucleaire et Physique des Particules, 1977 Prepared for LASL

(Contract W-7405-eng-36)

(DE82-002305; LA-TR-81-32) Avail: NTIS HC A02/MF A01

The development of secondary emission detectors is described. At the present time (and for the Saturn 2 project), the control of beams is accomplished by a network of ionization chambers (approx. = 35). These detectors are of the insertable type. The chambers allow adjustment of the beam (position, focusing, calculation of the flux density), but the matter of which they are composed most often makes it impossible to leave them for prolonged periods exposed to the beam. It was necessary to supplement the set of ionization detectors with another set of secondary emission detectors, a type of detector which can remain in the beam and which can, consequently, permanently ensure its visualization during experiments. A study was started on the secondary emission, the performance of the material and behavior of the vacuum in which the detector is inserted and we were able to construct a monitor, then a profile detector. DOE

N82-24480# Research Inst. of National Defence, Umea (Sweden).

COMPARISON AMONG COMMERCIALLY AVAILABLE GASEOUS CHLORINE WARNING DEVICES AND CHLORINE SENSORS [JAEMFOERELSE MELLAN KOMMERSIELLT TILLGAENGLIGA KLORGASVARNARE, FIGARO-SENSORER SAMT DEN KLORGASSENSOR SOM UTVECKLATS VID FOA 4]

Erik Dahlgren and Lars Haegglung Jan. 1982 31 p Partly in SWEDISH and ENGLISH

(FOA-C-40148-H2(C2)) Avail: NTIS HC A03/MF A01

A gaseous chlorine sensor, based on solid state semiconductor technology, detecting electrical modifications which appear in a thin film under the influence of chlorine, was developed for concentrations around the hygenic threshold value of 0.5 ppm. The sensor was compared to one electrochemical sensor used as a warning device and to five different types of solid state sensors. Tests are reported and the pertubing influence of humidity variations or the presence of other substances as carbon tetrachloride, sulfur dioxide, hydrochloric acid, ammonia chlorohenzene, carbon monoxide or excess of oxygen were examined. No classification is given, but the described sensor is the most selective to chlorine and the most insensitive to temperature and humidity variations, among the solid state devices.

Author (ESA)

N82-24481# Technische Physische Dienst TNO-TH, Delft (Netherlands).

HOLOGRAPHIC STUDY OF IMPACT PHENOMENA, PART 2

R. L. vanRenesse and H. J. Ratterink 7 Sep. 1981 21 p refs

(TPD-005-105; TDCK-75533; TPD-1981-0-3) Avail: NTIS HC A02/MF A01

Holographic studies of 10 mm thick ceramic disks struck by airgun pellets are compared with findings for 6 mm targets. Radial propagation of the deformation wave and axial deformation of the target are considered. The 10 mm targets have lower displacement velocities and greater fringe contrast, allowing deformation to be evaluated as a function of time. Radial propagation velocity relative to the moment of impact is 7200 m/sec for 6 mm targets, 5000 m/sec for 10 mm ones. Developing cracks follow the foot of the bulge at a constant distance, indicating that the crack tip propagates with the same average velocity as the foot of the bulge. Deviation between these results and previous ones are attributed to differences in the elastic properties of the ceramics. Author (ESA)

N82-24482# National Bureau of Standards, Washington, D.C.

USER'S MANUAL FOR FACTOR-JUMP THERMOGRAVIMETRY APPARATUS AND ASSOCIATED COMPUTER PROGRAMS, INCLUDING A GENERAL PLOTTING PROGRAM

Brian Dickens Mar. 1981 387 p refs

(PB82-109851; NBSIR-80-2102) Avail: NTIS HC A17/MF A01 CSCL 14B

The operation of the computerized thermogravimetry apparatus is described. Detailed instructions are given to enable the user to bootstrap the computer and run the various programs. The items covered are (1) the thermogravimetry program TGRUNF; (2) the data file editing program TGEDIT; (3) estimation of trimmed means by TGTRIM; (4) general calculation of activation energy from rate data; probability plots by TGDEPG; (5) the generalized polynomial fitting program POLGEP; (6) publication tables by TABLEP; (7) the BASIC program BMPD which operates the computer interface in a general fashion; and (8) user-directed and automated plotting using the generalized plotting program PABS. Appendices on cautionary remarks and cable diagrams are included. GRA

N82-24483# Bureau of Mines, Albany, Oreg.

MODIFICATION OF A COMMERCIAL ATOMIC ABSORPTION SPECTROPHOTOMETER FOR COLD-VAPOR DETERMINATION OF MERCURY

Jospeh A. Perry, Raymond F. Farrell, and Alick J. Mackie Oct. 1981 17 p refs

(PB82-135716; BM-RI-8573; LC-81-81-607897) Avail: NTIS

HC A02/MF A01 CSCL 14B

A commercial atomic absorption spectrophotometer was modified to rapidly determine trace levels of mercury by cold-vapor atomic absoptitn spectrophptpmetry. Such diverse materials as ores, mill products, stream water, sediments, and flue dust were analyzed. A very high dynamic range of 0.2 ng/ml to 1 microgram/ml of mercury in solutions is routinely analyzed by this instrument. Author (GRA)

N82-24484# GCA Corp., Bedford, Mass. Technology Div.
HIGH CONCENTRATION DUST MONITOR Final Open File Report, 28 Dec. 1979 - 29 May 1981
Pedro Lilienfeld Jun. 1981 77 p refs
(Contract DI-BM-HO-308010)
(PB82-139320; BM-OFR-159-81) Avail: NTIS HC A05/MF A01 CSCL 14B

The development, design, fabrication, and testing of a portable, self-contained prototype monitoring instrument capable of detecting and measuring airborne coal dust levels as concentrations in the range of 20 to 500 g/cu m is described. The output of the high concentration dust monitor is essentially independent of particle size and composition, with a response time of 10 seconds. Direct concentration readout as well as internal memory or recording capabilities are incorporated in the device. The operation of the instrument is based on direct sensing of the mass concentration of airborne dust by air-path beta radiation attenuation. The monitor is battery operated and incorporates a microprocessor that controls periodic automatic zero referencing, executes the mass computations, records the data for subsequent playback, and performs internal diagnostic checks. GRA

N82-24242# Societe pour le Perfectionnement des Materiels et Equipements Aerospatiaux, Toulouse (France).
TEST EQUIPMENT [LES MOYENS D'ESSAIS]
M. D. Dabadie *In* CNES The Technol. of Spaceborne Sci. Expt. 1981 p 737-765 In FRENCH (For primary document see N82-24215 15-12)
Avail: NTIS HC A99/MF A01

N82-24256# Joint Publications Research Service, Arlington, Va.
HOLOGRAPHIC EXPERIMENTS IN SPACE
S. Gorevich *In its* USSR Rept.: Space, No. 15 (JPRS-80424) 29 Mar. 1982 p 17-19 Transl. into ENGLISH from Aviats. Kosmonavt. (USSR), no. 11, Nov. 1981 p 42-43 (For primary document see N82-24253 15-12)
Avail: NTIS HC A07/MF A01

N82-25099*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
A PPM MODULATOR AND DEMODULATOR FOR THE 2.5 BIT/DETECTED PHOTON DEMONSTRATION
W. K. Marshall *In its* The Telecommun. and Data Acquisition Rept. 15 Apr. 1982 p 50-54 refs (For primary document see N82-25092 15-99)
Avail: NTIS HC A09/MF A01 CSCL 14B

N82-25109*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
ANALYSIS OF DSN PPM SUPPORT DURING VOYAGER 2 SATURN ENCOUNTER
C. D. Bartok *In its* The Telecommun. and Data Acquisition Rept. 15 Apr. 1982 p 139-150 ref (For primary document see N82-25092 15-99)
Avail: NTIS HC A09/MF A01 CSCL 14B

N82-25121 United Technologies Corp., Sunnyvale, Calif. Chemical Systems Div.
OPTICAL HOLOGRAPHIC STRUCTURAL ANALYSIS OF KEVLAR ROCKET MOTOR CASES
W. J. Harris *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 1 May 1981 p 113-149 (For primary document see N82-25112 15-99)
Copyright. Avail: NTIS HC $60.50/MF $60.50 CSCL 14/2

36 LASERS AND MASERS

Includes parametric amplifiers.

N82-24485*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LASER RESONATOR Patent Application
Lawrence W. Harper, inventor (to NASA) (International Laser Systems, Inc.) Filed 5 Jun. 1981 18 p Sponsored by NASA
(NASA-Case-GSC-12565-1; US-Patent-Appl-SN-270763) Avail: NTIS HC A02/MF A01 CSCL 20E

An optical resonator cavity configuration uses a unitary mirror with an oppositely directed convex reflective surface and a concave reflective surface disposed into one fold which concertedly reverses both ends of a beam propagating from a laser rod disposed between two total internal reflection prisms. The prisms are rigidly positioned with perpendicularly crossed virtual rooflines by a compact optical bed. The rooflines of the internal reflection prisms are arranged perpendicularly to the axis of the laser beam and to the optical axis of the optical resonator components. NASA

N82-24486# Rochester Univ., N. Y. Dept. of Chemistry.
MICROSCOPIC THEORY OF ELECTRONIC TRANSITIONS IN MOLECULAR RATE PROCESSES Final Scientific Report
Thomas F. George Dec. 1981 11 p refs
(Contract F49620-78-C-0005; AF Proj. 2303)
(AD-A111896; AFOSR-82-0161TR) Avail: NTIS HC A02/MF A01 CSCL 20/5

Gas-phase molecular rate processes involving electronic transitions have been studied theoretically, both in the absence (field-free) and in the presence of a laser field. Field-free studies have been carried out for the reaction F + H2 yields HF + H involving the dynamic coupling between two potential energy surfaces. This reaction has also been considered in the presence of a near-infrared laser. Other laser-stimulated gas-phase processes include energy transfer in the Na + Xe collision system, collisional ionization in the He*(1s2s) + Ar system and the spectroscopy of field-dressed quasibound states in the Xe + F system. Laser stimulated processes at a gas-surface interface have been studied, including desorption, migration, predissociation and atom-surface scattering. GRA

N82-24487# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
AN ANALYTICAL MODEL FOR PREDICTING GAIN, INTENSITY AND OUTPUT POWER OF FAST SPEED FLOWING LASERS
Gao Zhi and Zhao Shutao 3 Feb. 1982 24 p refs Transl. into ENGLISH from Acta Mech. Sinica (China), no. 2, 1980 p 129-138
(AD-A111408; FTD-ID(RS)T-0866-81) Avail: NTIS HC A02/MF A01 CSCL 20/5

The thermal motion distribution of gas particles based on the rate equations are used for analytical expressions for predicting gain, intensity and output power of gas flowing lasers. Present expressions are reduced to the well known formulae of nonflowing gas lasers if flow velocity has vanished. The effects of the changes in mirror reflectivity and the changes of the time-dependent gas excitation in upstream of the cavity are considered. GRA

N82-24488# Naval Research Lab., Washington, D. C. Optical Probes Branch.
APPLICATION OF TIME-RESOLVED SPECTROSCOPIES TO THE STUDY OF ENERGETIC MATERIALS - 1981: A SUMMARY REPORT Interim Report
J. M. Schnur 5 Mar. 1982 67 p refs
(RR0240202)
(AD-A112545; NRL-MR-4755) Avail: NTIS HC A04/MF A01 CSCL 20/5

This report describes recent progress in Naval Research Laboratory's research involving the application of advanced spectroscopies to the study of energetic materials. The goal of this initial spectroscopic studies are to provide the appropriate species identification protocols suitable for the study of fast

energetic reactions stimulated by light, heat, and/or shock. One of the major objectives of this Special Focus Program is to identify and characterize the important initial stages of energetic reactions as a function of initiation mode. In order to do this, techniques must be developed to observe the critical chemical fragments in the required time scales (e.g. 10-11 sec) and to elucidate the kinetics. Using these data attempts will be made to modify and control the course of the observed energetic reactions. GRA

N82-24489# Research Inst. of National Defence, Linkoeping (Sweden).
STUDY VISIT TO UNITED STATES LASER TECHNOLOGY CENTERS, 1981 [RAPPORT FRAAN USA-RESA INOM LASEROMRAADET, 1981]
Ove Steinvall Jan. 1982 29 p Partly in SWEDISH and ENGLISH
(FOA-C-30257-E1) Avail: NTIS HC A03/MF A01

Coherent infrared radar and coherent CO2 laser radar were studied. Information from visits to research laboratories and radar manufacturers is outlined, focusing on TEA lasers, heterodyne radiometers, laser absorption spectrometers, and transportable measurement radar. Airborne oceanographic lidar, laser cloud mappers, and oceanographic detection were examined. Infrared imaging systems, and hydrographic laser sounders were investigated. Author (ESA)

N82-24906# Innsbruck Univ. (Austria).
RECENT SPECTROSCOPIC AND LASER RELEVANT INVESTIGATIONS Progress Report
F. Howorka, I. Kuen, W. Federer, B. Jelenkovic (Inst. of Physics, Beograd, Yugoslavia), F. H. Futrell (Utah Univ.), K. Rozsa (Central Research Inst. for Physics), A. Ding (Hahn-Meitner Institut fuer Kernsforschung), and R. N. Varney *In its* Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 150-153 refs (For primary document see N82-24880 15-70)
Avail: NTIS HC A16/MF A01

N82-24907# Freiburg Univ. (West Germany). Fakultaet fuer Physik.
ANALYSIS OF DISCRETE AND CONTINUOUS LASER INDUCED FLUORESCENCE SPECTRA OF THE A(1) SIGMA(+) SUB U-X(1) SIGMA(+) SUB G BAND SYSTEM OF SR SUB 2
G. Gerber and R. Moeller *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 168-171 refs (For primary document see N82-24880 15-70)
Avail: NTIS HC A16/MF A01

N82-24909# Technische Univ., Vienna (Austria). Inst. fuer Allgemeine Physik.
BASIC PROBLEMS ASSOCIATED WITH THE INTERPRETATION OF THE FLUOESCENCE SPECTRA IN DOPPLER-SHIFT LASER SPECTROSCOPY
K. Thomsen, W. Husinsky, and G. Betz *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 178-183 refs (For primary document see N82-24880 15-70)
Avail: NTIS HC A16/MF A01

N82-24910# Central Research Inst. for Physics, Budapest (Hungary).
He-Ne LASER IN HOLLOW CATHODE DISCHARGE
K. Rozsa, M. Janossy, F. Howorka (Innsbruck Univ.), and I. Kuen (Innsbruck Univ.) *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 184-189 refs Sponsored by Fonds zur Foerderung der Wissenschaflichen forschung (For primary document see N82-24880 15-70)
Avail: NTIS HC A16/MF A01

N82-24911# Innsbruck Univ. (Austria). Inst. fuer Experimentalphysik.
VACUUM ULTRAVIOLET SPECTROSCOPY OF HOLLOW CATHODE DISCHARGES
I. Kuen and F. Howorka *In its* Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 190-194 refs Sponsored by Fonds zur Foerderung der Wissenschaflichen Forschung (For primary document see N82-24880 15-70)
Avail: NTIS HC A16/MF A01

N82-25097*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
ELECTRONIC BEAM STEERING OF SEMICONDUCTOR INJECTION LASERS
J. Katz *In its* The Telecommun. and Data Acquisition Rept. 15 Apr. 1982 p 25-41 refs (For primary document see N82-25092 15-99)
Avail: NTIS HC A09/MF A01 CSCL 20E

N82-25098*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
PHASE CONTROL AND BEAM STEERING OF SEMICONDUCTOR LASER ARRAYS
J. Katz *In its* Telecommun. and Data Acquisition Rept. 15 Apr. 1982 p 42-49 refs (For primary document see N82-25092 15-99)
Avail: NTIS HC A09/MF A01 CSCL 20E

37 MECHANICAL ENGINEERING

Includes auxiliary systems (non-power); machine elements and processes; and mechanical equipment.

N82-24490* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
CONTINUOUS SELF-LOCKING SPIRAL WOUND SEAL Patent
Stephen C. Irick, inventor (to NASA) Issued 5 Jan. 1982 5 p Filed 20 Nov. 1979 Supersedes N80-16339 (18 - 07, p 0860)
(NASA-Case-LAR-12315-1; US-Patent-4,309,039; US-Patent-Appl-SN-096257; US-Patent-Class-277-1; US-Patent-Class-277-2; US-Patent-Class-277-4; US-Patent-Class-277-59; US-Patent-Class-277-72R; US-Patent-Class-277-105; US-Patent-Class-277-204; US-Patent-Class-285-37; US-Patent-Class-220-378) Avail: US Patent and Trademark Office CSCL 11A

A spiral wound seal for effecting a seal between two surfaces is described. The seal consists of a strip of gasket material wound into a groove machined into one of the surfaces. The gasket strip is wider than the groove is deep so that a portion of the gasket material protrudes from the groove. The seal is effected by clamping the second surface onto the first surface and compressing the protruding gasket material.
Official Gazette of the U.S. Patent and Trademark Office

N82-24491* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
PRECISION HEAT FORMING OF TETRAFLUOROETHYLENE TUBING Patent
W. V. Ruiz (Rockwell International Corp., Downey, Calif.) and C. S. Thatcher, Inventors (to NASA) (Rockwell International Corp., Downey, Calif.) Issued 26 May 1981 5 p Filed Jan. 1980 Supersedes N80-17292 (18-08, p 0989) Sponsored by NASA
(NASA-Case-MSC-18430-1; US-Patent-4,269,640; US-Patent-Appl-SN-113015; US-Patent-Class-156-84; US-Patent-Class-156-85; US-Patent-Class-156-86; US-Patent-Class-264-230; US-Patent-Class-264-342R) Avail: US Patent and Trademark Office CSCL 13I

An invention that provides a method of altering the size of tetrafluoroethylene tubing which is only available in limited combination of wall thicknesses and diameter are discussed. The method includes the steps of sliding the tetrafluoroethylene tubing onto an aluminum mandrel and clamping the ends of the tubing to the mandrel by means of clamps. The tetrafluorethylene tubing and mandrel are then placed in a supporting coil which with the mandrel and tetrafluorethylene tubing are then positioned in a insulated steel pipe which is normally covered with a fiber glass insulator to smooth out temperature distribution therein. The entire structure is then placed in an event which heats the tetrafluorethylene tubing which is then shrunk by the heat to the outer dimension of the aluminum mandrel. After cooling the aluminum mandrel is removed from the newly sized tetrafluorethylene tubing by a conventional chemical milling process.
Official Gazette of the U.S. Patent and Trademark Office

N82-24492* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

SPRAY COATING APPARATUS HAVING A ROTATABLE WORKPIECE HOLDER Patent

Marnell Smith, Victor W. Katvala, and Ernest E. Porter, inventors (to NASA) Issued 26 Jan. 1982 5 p Filed 22 Sep. 1978 Supersedes N78-32434 (16 - 23, p 3085)
(NASA-Case-ARC-11110-1; US-Patent-4,312,292; US-Patent-Appl-SN-945040; US-Patent-Class-118-320; US-Patent-Class-118-500; US-Patent-Class-118-503; US-Patent-Class-118-505; US-Patent-Class-427-425) Avail: US Patent and Trademark Office CSCL 13I

A spray coating apparatus is provided for rotating a workpiece relative to a spray station to obtain a uniform coating of the workpiece. In a typical example, the workpiece comprises a ceramic tile which is to be coated with a ceramic coating and the tile is to be used as a reusable component of the thermal protection system for a space shuttle. The apparatus for rotating the workpiece includes a base support having a first rotatable stage for rotation in the horizontal plane and a second rotatable stage for rotation in a second plane inclined at an angle, such as 45 degrees, to the horizontal plane and the workpiece is supported on this second stage. Thus the workpiece is rotatable in both of two planes of rotation.

Official Gazette of the U.S. Patent and Trademark Office

N82-24493* National Aeronautics and Space Administration. Pasadena Office, Calif.

HERMETIC SEAL FOR A SHAFT Patent

Frank Lombardi, inventor (to NASA) (JPL, California Inst. of Tech., Pasadena) Issued 19 Jan. 1982 5 p Filed 30 May 1980 Supersedes N80-25660 (18-1, p 2133) Sponsored by NASA
(NASA-Case-NPO-15115-1; US-Patent-4,311,057; US-Patent-Appl-SN-154725; US-Patent-Class-74-18.1; US-Patent-Class-92-37; US-Patent-Class-74-18.2) Avail: US Patent and Trademark Office CSCL 11A

An hermetic seal for a linear rod having a portion thereof projected axially through a port defined in a wall for a pressure chamber and supported thereby for omni-directional motion is described. The seal is characterized by a resilient, impervious, cylindrical body having a first section concentrically related to the shaft and integrally affixed thereto comprising a linear ordered array of annular flutes. A second section integrally is affixed to the wall of the chamber and concentrically related to the port comprising a second linear ordered array of annular flutes. A third section is interposed between the first and second sections and integrally affixed in coaxial alignment therewith comprising an annular ordered array of linear flutes concentrically related to the shaft, whereby axial, angular, and pivotal motion of the rod is accommodated.

Official Gazette of the U.S. Patent and Trademark Office

N82-24494* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

HIGH TEMPERATURE PENETRATOR ASSEMBLY WITH BAYONET PLUG AND RAMP-ACTIVATED LOCK Patent

Kenneth E. Wood, inventor (to NASA) (Rockwell International Corp., Downey, Calif.) Issued 23 Mar. 1982 7 p Filed 7 Feb. 1980 Supersedes N80-19468 (18 - 10, p 1293) Sponsored by NASA
(NASA-Case-MSC-18526-1; US-Patent-4,320,911; US-Patent-Appl-SN-119335; US-Patent-Class-285-89; US-Patent-Class-285-159; US-Patent-Class-285-401; US-Patent-Class-403-315) Avail: US Patent and Trademark Office CSCL 13I

A penetration apparatus, for very high temperature applications in which a base plug is inserted into an opening through a bulkhead is described. The base plug has a head shape and is seated against the highest temperature surface of the bulkhead, which may be the skin of the nose cone or other part of a space vehicle intended for nondestructive atmospheric reentry. From the second side of the bulkhead at which the less severe environment is extant, a bayonet plug is inserted into the base plug and engages an internal shoulder at about 90 deg rotation. The bayonet plug has an integral flanged portion and a pair of ramping washers which are located between the flange and the second bulkhead surface with a spacing washer as necessary.

Official Gazette of the U.S. Patent and Trademark Office

N82-24495*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

PAST PERFORMANCE ANALYSIS OF HPOTP BEARINGS

B. N. Bhat and F. J. Dolan Mar. 1982 39 p refs
(NASA-TM-82470; NAS 1.15:82470) Avail: NTIS HC A03/MF A01 CSCL 13I

The past performance analysis conducted on three High Pressure Oxygen Turbopump (HPOTP) bearings from the Space Shuttle Main Engine is presented. Metallurgical analysis of failed bearing balls and races, and wear track and crack configuration analyses were carried out. In addition, one bearing was tested in laboratory at very high axial loads. The results showed that the cracks were surface initiated and propagated into subsurface locations at relatively small angles. Subsurface cracks were much more extensive than was appeared on the surface. The location of major cracks in the races corresponded to high radial loads rather than high axial loads. There was evidence to suggest that the inner races were heated to evevated temperatures. A failure scenario was developed based on the above findings. According to this scenario the HPOTP bearings are heated by a combination of high loads and high coefficient of friction (poor lubrication). Different methods of extending the HPOTP bearing life are also discussed. These include reduction of axial loads, improvements in bearing design, lubrication and cooling, and use of improved bearing materials. Author

N82-24496*# Eaton Engineering and Research Center, Southfield, Mich.

SMALL PASSENGER CAR TRANSMISSION TEST: MERCURY LYNX ATX TRANSMISSION Final Report

M. P. Bujold Sep. 1981 335 p
(Contract DEN3-124; DE-AI01-77CS-51044)
(NASA-CR-165510; DOE/NASA/0124-7; NAS 1.26:165510; ERC-TR-8191) Avail: NTIS HC A15/MF A01 CSCL 13I

The testing of a Mercury Lynx automatic transmission is reported. The transmission was tested in accordance with a passenger car automatic transmission test code (SAE J65lb) which required drive performance, coast performance, and no load test conditions. Under these conditions, the transmission attained maximum efficiencies in the mid-ninety percent range both for drive performance test and coast performance tests. The torque, speed, and efficiency curves are presented, which provide the complete performance characteristics for the Mercury Lynx automatic transmission. J.D.

N82-24497*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

DEVELOPMENT OF HIGH-SPEED ROLLING-ELEMENT BEARINGS. A HISTORICAL AND TECHNICAL PERSPECTIVE

Erwin V. Zaretsky 1982 28 p refs Presented at the SKF Seventy-Fifth Anniv. Celebration Meeting, Nieuwegin, Netherlands, 9 Jun. 1982; sponsored by SKF Research and Development Center
(NASA-TM-82884; E-1198; NAS 1.15:82884) Avail: NTIS HC A03/MF A01 CSCL 13I

Research on large-bore ball and roller bearings for aircraft engines is described. Tapered roller bearings and small-bore bearings are discussed. Temperature capabilities of rolling element bearings for aircraft engines have moved from 450 to 589 K (350 to 600 F) with increased reliability. High bearing speeds to 3 million DN can be achieved with a reliability exceeding that which was common in commercial aircraft. Capabilities of available bearing steels and lubricants were defined and established. Computer programs for the analysis and design of rolling element bearings were developed and experimentally verified. The reported work is a summary of NASA contributions to high performance engine and transmission bearing capabilities. R.J.F.

N82-24498# Rensselaer Polytechnic Inst., Troy, N. Y. Dept. of Mechanical Engineering.

ANALYSIS OF LUBRICANT FILMS IN BEARINGS UNDER INCIPIENT FAILURE CONDITIONS Final Report, 1 Jan. 1978 - 30 Jun. 1981

James L. Lauer 1981 91 p refs
(Grant AF-AFOSR-3473-78; AF Proj. 2303)
(AD-A110642; AFOSR-82-0010TR) Avail: NTIS

HC A05/MF A01 CSCL 11/8

Infrared emission spectra have been obtained from operating elastohydrodynamic bearings through a diamond window. Failure modes were observed in two instances, with a cycloparaffinic and an aromatic lubricant, both in the presence of an organic chloride. The mechanism of carbonization and polymerization appeared to be ionic in each case. All the infrared spectra were polarized to a degree depending on the shear rate and more so in presence of an organic chloride. In at least one case the chloride came out of solution and two phase flow occurred. The instrumentation developed is so discriminating and sensitive that spectra from layers as thin as one molecular thickness would seem to be obtainable. It can therefore be useful for surface analysis in different situations. Author (GRA)

N82-24499# Pacific Northwest Lab., Richland, Wash.
WIRE ROPE IMPROVEMENT PROGRAM Final Report
J. M. Alzheimer, W. E. Anderson, G. H. Beeman, G. B. Dudder, R. Erickson (Battelle Columbus Labs, Ohio), W. A. Glaeser (Battelle Columbus Labs., Ohio), R. L. Jentgen (Battelle Columbus Labs., Ohio), R. R. Rice (Battelle Columbus Labs., Ohio), and L. A. Strope Sep. 1981 165 p refs
(Contract DE-AC06-76RL-01830)
(DE82-001874; PNL-3976) Avail: NTIS HC A08/MF A01

Activities in five major areas were undertaken during the WRIP: Experiments using PNL-developed bend-over-sheave fatigue test machines to generate data on which to base a model for predicting large-diameter rope performance from that of small-diameter ropes; bend-over-sheave fatigue testing to determine differences in rope failure rates at varying rope loads; analyses to determine how wire ropes actually fail; development of a load sensor to record and quantity operational loads on drag and hoist ropes; and technology transfer activities to disseminate useful program findings to coal mine operators. Data obtained during the 6-year program support are included. High loads on wire ropes are damaging. As an adjunct, however, potentially useful countermeasures to high loads were identified. Large-diameter rope bend-over-sheave performance can be predicted from small-diameter rope test behavior, over some ranges. DOE

N82-24227# Centre National d'Etudes Spatiales, Toulouse (France).
THE TECHNOLOGY OF ELECTROMECHANICAL DEVICES AND PNEUMATIC CIRCUITS [TECHNOLOGIE DES ELECTROMECANISMES ET DES CIRCUITS PNEUMATIQUES]
J. Maquet, L. Petitjean, and R. Salome *In its* The Technol. of Spaceborne Sci. Expt. 1981 p 349-417 refs In FRENCH (For primary document see N82-24215 15-12)
Avail: NTIS HC A99/MF A01

38 QUALITY ASSURANCE AND RELIABILITY

Includes product sampling procedures and techniques; and quality control.

N82-24500# National Aerospace Lab., Amsterdam (Netherlands). Bauweisen und Werkstoffe Haupabt.
COMPARISON BETWEEN PROBABILITY OF DETECTION, SENSITIVITY, AND ACCURACY OF FIVE NONDESTRUCTIVE INSPECTION METHODS
E. A. B. deGraaf and P. deRijk 25 Jun. 1981 13 p refs In DUTCH; ENGLISH summary Presented at Europaeische Tagung fuer zerstoerungsfreie Pruefung, Vienna, 14-16 Sep. 1981
(NLR-MP-81038-U) Avail: NTIS HC A02/MF A01

Approximately 200 high strength steel (AISI4340) aircraft undercarriage retraction cylinders, only part of which contained fatigue tracks, were subjected to five different nondestructive tests by six inspectors. Penetrants, ultrasonic flaw detection, eddy currents, and magnetic measurements were used. Results of all these methods and inspectors were compared. Considerable scattering in the results was observed. The ultrasonic method reliability is low. The results of fluorescent color penetration and eddy currents are moderate. Due to its high reliability, magnetic inspection is preferred. Author (ESA)

N82-24235# Centre National d'Etudes Spatiales, Toulouse (France).
PRODUCT RELIABILITY CONTROL IN SPACE PROGRAMS [L'ASSURANCE PRODUIT DANS LES PROGRAMMES SPATIAUX]
R. Chauffriasse *In its* The Technol. of Spaceborne Sci. Expt. 1981 p 581-616 In FRENCH (For primary document see N82-24215 15-12)
Avail: NTIS HC A99/MF A01

N82-24238# Centre National d'Etudes Spatiales, Toulouse (France).
EVALUATION OF THE QUALITY OF MICROWAVE COMPONENTS [L'EVALUATION DE LA QUALITE DES COMPOSANTS HYPERFREQUENCES]
M. A. Cuquel *In its* The Technol. of Spaceborne Sci. Expt. 1981 p 649-657 In FRENCH (For primary document see N82-24215 15-12)
Avail: NTIS HC A99/MF A01

N82-24364# European Space Research and Technology Center, Noordwijk (Netherlands).
THE ESA PRODUCT ASSURANCE SPECIFICATION SYSTEM
A. J. S. Capella and M. vonHoegen *In* ESA 2nd ESA Prod. Assurance Symp. Jan. 1982 p 13-20 (For primary document see N82-24362 15-31)
Avail: NTIS HC A11/MF A01; ESA, Paris FF 120 Member States, AU, CN and NO (+20% others)

N82-24365# European Space Research and Technology Center, Noordwijk (Netherlands).
PRODUCT ASSURANCE REQUIREMENTS FOR SPACELAB EXPERIMENTS
P. DiPalermo *In* ESA 2nd ESA Prod. Assurance Symp. Jan. 1982 p 21-26 (For primary document see N82-24362 15-31)
Avail: NTIS HC A11/MF A01; ESA, Paris FF 140 Member States, AU, CN and NO (+20% others)

N82-24366# Centre National d'Etudes Spatiales, Toulouse (France).
FUTURE TRENDS OF ARIANE PROJECT AND CNES QUALITY ASSURANCE
Pierre Quemarec *In* ESA 2nd Prod. Assurance Symp. Jan. 1982 p 27-30 refs (For primary document see N82-24362 15-31)
Avail: NTIS HC A11/MF A01; ESA, Paris FF 140 Member States, AU, CN and NO (+20% others)

N82-24367# European Space Agency, Paris (France). Contracts Dept.
PRODUCT LIABILITY: PRESENT STATUS, TRENDS AND PREVENTIVE MEASURES
W. Thoma *In its* 2nd ESA Prod. Assurance Symp. Jan. 1982 p 31-38 (For primary document see N82-24362 15-31)
Avail: NTIS HC A11/MF A01; ESA, Paris FF 140 Member States, AU, CN and NO (+20% others)

N82-24368# Indian Space Research Organization, Bangalore. Satellite Centre.
PRODUCT ASSURANCE POLICY AND MANAGEMENT APPLIED TO INDIAN SPACE PROGRAMS
K. R. Ramgopal *In* ESA 2nd ESA Prod. Assurance Symp. Jan. 1982 p 37-42 (For primary document see N82-24362 15-31)
Avail: NTIS HC A11/MF A01; ESA, Paris FF 140 Member States, AU, CN and NO (+20% others)

N82-24369# National Space Development Agency, Tokyo (Japan).
QUALITY ASSURANCE ON JAPANESE SPACE PROGRAMMES
T. Makino and M. Shimodaira *In* ESA 2nd ESA Prod. Assurance Symp. Jan. 1982 p 43-48 (For primary document see N82-24362 15-31)

Avail: NTIS HC A11/MF A01; ESA, Paris FF 140 Member States, AU, CN and NO (+20% others)

N82-24370# Communications Satellite Corp., Clarksburg, Md.
PRODUCT ASSURANCE REQUIREMENTS FOR THE INTELSAT 6 SATELLITE SERIES
R. Strauss and I. Feigenbaum *In* ESA 2nd ESA Product Assurance Symp. Jan. 1982 p 49-56 refs Sponsored in part by International Telecommunications Satellite Oganization (For primary document see N82-24362 15-31)
Avail: NTIS HC A11/MF A01; ESA, Paris FF 140 Member States, AU, CN and NO (+20% others)

N82-24371# Beijing Inst. of Control Engineering (China).
A NEW APPROACH FOR FAULT-TREE ANALYSIS
Liao Jion-sheng *In* ESA 2nd ESA Prod. Assurance Symp. Jan. 1982 p 57-62 refs (For primary document see N82-24362 15-31)
Avail: NTIS HC A11/MF A01; ESA, Paris FF 140 Member States, AU, CN and NO (+20% others)

N82-24372# Aerospace Corp., Los Angeles, Calif.
NAVSTAR/GLOBAL POSITIONING SYSTEM PRODUCT ASSURANCE PROGRAM
Allan J. Boardman *In* ESA 2nd Prod. Assurance Symp. Jan. 1982 p 63-72 (For primary document see N82-24362 15-31)
Avail: NTIS HC A11/MF A01; ESA, Paris FF 140 Member States, AU, CN and NO (+20% others)

N82-24373# British Aerospace Dynamics Group, Stevenage (England).
PRIME PRODUCT ASSURANCE MANAGEMENT (FUTURE TRENDS)
S. G. Wilson *In* ESA 2nd ESA Prod. Assurance Symp. Jan. 1982 p 75-78 (For primary document see N82-24362 15-31)
Avail: NTIS HC A11/MF A01; ESA, Paris FF 140 Member States, AU, CN and NO (+20% others)

N82-24374# Selenia S.p.A., Rome (Italy).
A SUBCONTRACTOR'S APPROACH TO PRODUCT ASSURANCE AND SPECIAL PROBLEMS ENCOUNTERED
A. Vitacolonna *In* ESA 2nd ESA Prod. Assurance Symp. Jan. 1982 p 79-84 (For primary document see N82-24362 15-31)
Avail: NTIS HC A11/MF A01; ESA, Paris FF 140 Member States, AU, CN and NO (+20% others)

N82-24377# Spar Aerospace Products Ltd., Toronto (Ontario). Remote Manipulator Systems Div.
A CANADIAN APPROACH TO PRODUCT ASSURANCE IN SPACE ACTIVITIES
P. N. Ibbotson and B. Thomas *In* ESA 2nd ESA Prod. Assurance Symp. Jan. 1982 p 105-111 refs (For primary document see N82-24362 15-31)
Avail: NTIS HC A11/MF A01; ESA, Paris FF 140 Member States, AU, CN and NO (+20% others)

N82-24378# Thomson-CSF, Orsay (France).
ESTABLISHING CONFIDENCE IN ADVANCED TECHNOLOGIES FOR SPACE APPLICATIONS
J. P. Plantard and F. Violet *In* ESA 2nd ESA Prod. Assurance Symp. Jan. 1982 p 115-120 (For primary document see N82-24362 15-31)
Avail: NTIS HC A11/MF A01; ESA, Paris FF 140 Member States, AU, CN and NO (+20% others)

N82-24380# Asternetics and Associates, Inc., Manhattan. Beach, Calif.
FAILURE RATE STUDY
D. L. Stern *In* ESA 2nd ESA Product Assurance Symp. Jan. 1982 p 133-137 (For primary document see N82-24362 15-31)
Avail: NTIS HC A11/MF A01; ESA, Paris FF 140 Member States, AU, CN and NO (+20% others)

N82-24381# Fleet Missile Systems Analysis and Evaluation Group Annex, Corona, Calif. GIDEP Operations Center.
GIDEP, A TOOL FOR PRODUCT ASSURANCE
Edwin T. Richards *In* ESA 2nd ESA Prod. Assurance Symp. Jan. 1982 p 139-143 (For primary document see N82-24362 15-31)
Avail: NTIS HC A11/MF A01; ESA, Paris FF 140 Member States, AU, CN and NO (+20% others)

N82-24383# Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).
PROBLEMS AND CONSIDERATIONS FOR THE PROCUREMENT OF A 54K BIT CMOS RAM MEMORY HYBRID FOR LONG-TERM HIGH RELIABILITY SPACE APPLICATION
Erhard Jantz *In* ESA 2nd ESA Prod. Assurance Symp. Jan. 1982 p 159-165 refs (For primary document see N82-24362 15-31)
Avail: NTIS HC A11/MF A01; ESA, Paris FF 140 Member States, AU, CN and NO (+20% others)

N82-24385# Academy of Science of Water Conservancy and Electric Power, Beijing (China).
SYNTHESIS OF SYSTEM RELIABILITY
He Guo-Wei *In* ESA 2nd ESA Prod. Assurance Symp. Jan. 1982 p 185-189 ref (For primary document see N82-24362 15-31)
Avail: NTIS HC A11/MF A01; ESA, Paris FF 140 Member States, AU, CN and NO (+20% others)

N82-24387# Erno Raumfahrttechnik G.m.b.H., Bremen (West Germany).
ASSURANCE OF A MANNED SPACE PROGRAM
Juergen Levold *In* ESA 2nd ESA Product Assurance Symp. Jan. 1982 p 203-211 refs (For primary document see N82-24362 15-31)
Avail: NTIS HC A11/MF A01; ESA, Paris FF 140 Member States, AU, CN and NO (+20% others)

N82-24388# Aeritalia S.p.A., Torino (Italy).
FRACTURE CONTROL PROGRAM TO ENSURE STRUCTURAL SAFETY
G. Surbone *In* ESA 2nd ESA Prod. Assurance Symp. Jan. 1982 p 213-221 refs (For primary document see N82-24362 15-31)
Avail: NTIS HC A11/MF A01; ESA, Paris FF 140 Member States, AU, CN and NO (+20% others)

N82-25122 Science Applications, Inc., Irvine, Calif.
INTEGRATED NONDESTRUCTIVE EVALUATION SYSTEM
J. J. Glatz and D. H. Epperson *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 1 May 1981 p 151-173 refs (For primary document see N82-25112 15-99)
(Contract F33615-78-C-5132)
Copyright. Avail: NTIS HC $60.50/MF $60.50 CSCL 14/4

39 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; and thermal stress.

For applications see *05 Aircraft Design, Testing and Performance* and *18 Spacecraft Design, Testing and Performance*.

N82-24501*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
NONLINEAR STRUCTURAL AND LIFE ANALYSES OF A COMBUSTOR LINER
V. Moreno (Pratt and Whitney Aircraft Group, East Hartford, Conn.), G. J. Meyers (Pratt and Whitney Aircraft Group, East Hartford, Conn.), A. Kaufman, and G. R. Halford 1982 23 p refs Proposed for presentation at the Symp. on Advances and Trends in Struct. and Solid Mech., 4-7 Oct. 1982, Washington, D.C.; sponsored by NASA and Georgetown Univ.
(NASA-TM-82846; E-1216; NAS 1.15:82846) Avail: NTIS HC A02/MF A01 CSCL 20K

Three dimensional, nonlinear finite element structural analyses were performed for a simulated combustor liner specimen to assess the capability of nonlinear analyses using classical inelastic material models to represent the thermoplastic creep response of the one half scale component. Results indicate continued cyclic hardening and ratcheting while experimental data suggested a

stable stress strain response after only a few loading cycles. The computed stress strain history at the critical location was put into two life prediction methods, strainrange partitioning and a Pratt and Whitney combustor life prediction method to evaluate their ability to predict cyclic crack initiation. It is found that the life prediction analyses over predicted the observed cyclic crack initiation life. E.A.K.

N82-24502*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EVALUATION OF INELASTIC CONSTITUTIVE MODELS FOR NONLINEAR STRUCTURAL ANALYSIS
Albert Kaufman 1982 22 p refs Presented at the Symp. on Nonlinear Constitutive Relations for High Temp. Appl., Akron, Ohio, 19-20 May 1982; sponsored by NASA and Akron Univ.
(NASA-TM-82845; E-1215; NAS 1.15:82845) Avail: NTIS HC A02/MF A01 CSCL 20K

The influence of inelastic material models on computed stress-strain states, and therefore predicted lives, was studied for thermomechanically loaded structures. Nonlinear structural analyses were performed on a fatigue specimen which had been subjected to thermal cycling in fluidized beds and on a mechanically load cycled benchmark notch specimen. Four incremental plasticity creep models (isotropic, kinematic, combined isotropic kinematic, combined plus transient creep) were exercised using the MARC program. Of the plasticity models, kinematic hardening gave results most consistent with experimental observations. Life predictions using the computed strain histories at the critical location with a strainrange partitioning approach considerably overpredicted the crack initiation life of the thermal fatigue specimen. S.L.

N82-24503*# Georgia Inst. of Tech., Atlanta. Center for the Advancement of Computational Mechanics.
CREEP CRACK-GROWTH: A NEW PATH-INDEPENDENT T SUB O AND COMPUTATIONAL STUDIES
R. B. Stonesifer and S. N. Atluri Dec. 1981 141 p refs
(Grant NAG3-38)
(NASA-CR-168930; NAS 1.26:168930) Avail: NTIS HC A07/MF A01 CSCL 20K

Two path independent integral parameters which show some degree of promise as fracture criteria are the C* and delta T sub c integrals. The mathematical aspects of these parameters are reviewed. This is accomplished by deriving generalized vector forms of the parameters using conservation laws which are valid for arbitrary, three dimensional, cracked bodies with crack surface tractions (or applied displacements), body forces, inertial effects and large deformations. Two principal conclusions are that delta T sub c is a valid crack tip parameter during nonsteady as well as steady state creep and that delta T sub c has an energy rate interpretation whereas C* does not. An efficient, small displacement, infinitestimal strain, displacement based finite element model is developed for general elastic/plastic material behavior. For the numerical studies, this model is specialized to two dimensional plane stress and plane strain and to power law creep constitutive relations. S.L.

N82-24504# Virginia Polytechnic Inst. and State Univ., Blacksburg. Coll. of Engineering.
THERMO-MECHANICAL AND THERMAL BEHAVIOR OF HIGH-TEMPERATURE STRUCTURAL MATERIALS Interim Report, 1 Jan. - 31 Dec. 1981
D. P. H. Hasselman, L. D. Bentsen, J. J. Brennan, N. Claussen, and C. E. Knight 31 Dec. 1981 179 p refs
(Contract N00014-78-C-0431)
(AD-A111575) Avail: NTIS HC A09/MF A01 CSCL 11/2

The thermomechanical and thermal behavior of high temperature structural materials wre reported as follows: (1) observations on the characteristics of a fluidized bed for the thermal shock testing of brittle ceramics; (2) effect of delta-T and spatially varying heat transfer coefficient on thermal stress resistance of brittle ceramics measured by the quenching method; (3) analysis of effect of crack interaction on nature of strength loss in thermally shocked brittle ceramics; (4) analysis of thermal fatigue behavior of brittle structural materials; (5) analysis of thermal stresses in a partially absorbing plate asymmetrically heated by cyclic thermal radiation and cooled by convection; (6) anisotropy effects in the thermal diffusivity of Si3N4-BN composites; (7) thermal diffusivity of silicon carbide-silicon composites; (8) effect of microcracking on the conduction of heat in brittle composites; (9) measurement of the thermal conductivity and diffusivity of fine silicon carbide fibers by the composite technique; and (10) thermal stress in materials heated internally by radiation absorption. DOE

N82-24505# Naval Postgraduate School, Monterey, Calif.
A STUDY OF NOTCH FATIGUE. PART 1: STATIC PHOTOELASTIC MEASUREMENTS
Gerald H. Lindsey Jun. 1981 85 p refs
(AD-A111473; NPS67-81-004-Pt-1) Avail: NTIS HC A05/MF A01 CSCL 20/11

A careful facility calibration of photoelastic measurements on uniaxial tension specimens containing stress concentrations was conducted. Thorough characterizations of both mechanical and optical properties were made in preparation for notch studies in the linear and nonlinear regimes. As a part of the work, a new elasticity solution is obtained to evaluate the effect on stress levels at the notch of Poisson's ratio mismatch between coating and specimen. Author (GRA)

N82-24506# Florida Univ., Gainesville.
STUDIES ON THE FRACTURE MECHANISMS IN PARTIALLY PENETRATED FILAMENT REINFORCED LAMINATED PLATES Final Report
R. L. Sierakowski, C. A. Ross, L. E. Malvern, and H. W. Doddington 31 Dec. 1981 26 p refs
(Grant DAAG29-79-G-0007)
(AD-A110741; ARO-15989.7-E) Avail: NTIS HC A03/MF A01 CSCL 11/4

The overall objective of this program has been to obtain information on the fracture mechanisms occurring in centrally impacted composite plate configurations in order to establish basic design guidelines from systematic studies on geometrically controlled glass/epoxy composite material systems. In addition, information generated on the values of the dynamic material properties determined from the program should be of immediate use in penetration mechanics codes requiring such data.
Author (GRA)

N82-24507# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
ELASTIC-PLASTIC FINITE ELEMENT MODEL COMPARISONS IN FRACTURE MECHANICS M.S. Thesis
Howard Dwight Gans Dec. 1981 134 p refs
(AD-A111122; AFIT/GAE/AA/81D-10) Avail: NTIS HC A07/MF A01 CSCL 20/11

Stress near a crack tip in plasticity was analyzed using three different finite element modelings; a constant strain viscoplastic triangle, an eight-noded elastic-plastic quadrilateral and a crack tip elastic-plastic singularity element. The specimen under consideration was a center cracked plate made from IN-100. The half-crack length was 0.1367 in (3.472 mm). An elastic solution was formulated and two different loadings to generate plasticity were considered. Fine mesh and coarse mesh solutions for the higher order elements were generated and compared. Comparisons were made based on an equal number of degrees of freedom in two specific regions referred to as the near field and the far field regions. It was determined that the elements whose elastic solutions conformed best to linear elastic fracture mechanics predictions were the constant strain triangle and the eight-noded quadrilateral in a fine mesh. The crack tip element did not perform as well as was expected. For the plastic analysis, the constant strain triangle exhibited the largest plastic region and gave the most accurate stress profiles. GRA

N82-24508# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
THE APPLICATION OF FINITE ELEMENT SOLUTION TECHNIQUES IN STRUCTURAL ANALYSIS ON A MICROCOMPUTER M.S. Thesis
Robert J. Hampson Dec. 1981 60 p refs
(AD-A111125; AFIT/GAE/AA/81D-13) Avail: NTIS HC A04/MF A01 CSCL 13/13

The feasibility of applying finite element solution techniques on a microcomputer was explored. The finite element solution techniques were applied in structural analysis. Three programming formats in finite element programs were explored. These were

sequential, overlays, and modular formats. The capabilities of the microcomputer with respect to these formats were explored. DOE

N82-24509# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.

THE VISCOPLASTIC CRACK GROWTH BEHAVIOR OF A COMPACT TENSION SPECIMEN USING THE BODNER-PARTON FLOW LAW M.S. Thesis

James W. Smail Dec. 1981 117 p refs

(AD-A111126; AFIT/GAE/AA/81D-28) Avail: NTIS HC A06/MF A01 CSCL 12/1

Creep crack growth in IN-100 was studied using a hybrid experimental-numerical procedure (HEN). This procedure couples displacement data generated during creep crack growth tests to a finite element model of the test specimen. A standard compact tension specimen geometry was used in all cases. The computer program used herein is a two-dimensional plane stress/plane strain code that uses constant strain triangular elements and has the ability to release fixed nodes to simulate crack growth. This procedure is facilitated by using a Gauss-Seidel iterative solution technique that allows appropriate terms in the stiffness matrix to be changed between timesteps to accommodate changing boundary conditions due to crack growth. A variable timestep algorithm maximizes the timestep size during the analysis while maintaining good accuracy. Constitutive equations proposed by Bodner and Partom were used to account for the nonlinear, viscoplastic material behavior exhibited by IN-100 at high temperatures. Crack growth estimates generated with the HEN procedure were within 20 percent of the actual crack growth in the test specimens after times ranging from 5-14 hours. GRA

N82-24510# Minnesota Univ., Minneapolis. Dept. of Aerospace Engineering and Mechanics.

THEORTICAL AND EXPERIMENTAL STUDIES IN THE RHEOMETRY OF VISCOELASTIC MATERIALS Final Report, 20 Feb. 1979 - 19 Nov. 1981

Daniel D. Joseph and Gordon S. Beavers 31 Dec. 1981 25 p refs

(Contract DAAG29-79-C-0038)

(AD-A110742; ARO-16036.15-E) Avail: NTIS HC A02/MF A01 CSCL 20/11

Theoretical and experimental studies of a wide range of problems in the rheometry of viscoelastic fluids and solids are described. Domain perturbation analyses and numerical computations are used to analyze the fluid motion between concentric and eccentric cylinders. Experiments involving free surface measurements complement the analysis and lead to the determination of parameters which characterize the fluid. Author (GRA)

N82-24511# General Atomic Co., San Diego, Calif.

IRRADIATION-INDUCED CREEP IN GRAPHITE: A REVIEW

R. J. Price Aug. 1981 75 p refs

(Contract DE-AT03-76ET-35301; GEN. ATOMIC Proj. 7400) (DE82-001141; GA-A-16402) Avail: NTIS HC A04/MF A01

Data on irradiation induced creep in graphite published since 1972 are reviewed. Sources include restrained shrinkage tests conducted at Petten, the Netherlands, tensile creep experiments with continuous strain registration at Petten and Grenoble, France, and controlled load tests with out of reactor strain measurement performed at Oak Ridge National Laboratory, Petten, and in the United Kingdom. The linear viscoelastic creep model with a coverable transient strain component followed by a steady state component is confirmed, except that the steady state creep coefficient must be treated as a function of neutron fluence and is higher for tensile loading than for compressive loading. The total transient creep strain is approximately equal to the proceeding elastic strain. No temperature dependence of the transient creep parameters was demonstrated. DOE

N82-24512# Deutsche Forschungs- und Versuchsanstalt fuer Luft- und Raumfahrt, Stuttgart (West Germany).

REPORT FROM THE WORKING PARTY ON NEW FIBER MATERIALS [AUS DER ARBEIT DES ARBEITSKREISES NEUARTIGE FASERWERKSTOFFE (ANF)]

C. Kensche 1981 12 p In GERMAN Presented at 5th Symp. fuer Segelflugzeugentwicklung, Brunswick, 16-17 Nov. 1981

Avail: NTIS HC A02/MF A01

The aims, activities and achievements of a working party on new fiber composites are discussed. Participants from industry and research institutions collaborated on the drafting of norms and specification sheets for these materials. Further research items include experimentation test stands and standardization of test procedures. Results on maximum yield stresses under tension, compression or shear are given for various specimens as well as in relation to fuselages or hulls. Author (ESA)

N82-24513# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).

THE MIXED VARIATIONAL PRINCIPLES IN VIBRATIONAL MECHANICS Ph.D. Thesis - Paris Univ. 6

Philippe Gibert 1981 203 p refs In FRENCH; ENGLISH summary Report will also be announced as translation (ESA-TT-765)

(ONERA-NT-1981-4; ISSN-0078-3781) Avail: NTIS HC A10/MF A01

Vibrations of mechanical systems with nonholonomic constraints are considered. A mixed variational formulation is used for a spectral problem. A numerical method is presented: it uses a penalty and a selective reduced integration technique. A numerical method is also proposed for bracketing the eigenfrequencies of a linear structure. This method consists in the solution of a subordinate static problem. This calculation makes it possible to bring to light a local parameter of modelling error. Its interpretation as a term of error of the constitutive law allows the determination of the zones where the errors due to the model are too large relative to the measuring precision on the coefficients of the constitutive law. Author (ESA)

N82-24514# Instituut TNO voor Werktuigkundige Constructies, Delft (Netherlands).

THE VIBRATORY BEHAVIOR OF A ROTATING PROPELLER SHAFT. PART 4: VIBRATION TESTS OF A ROTATING PROPELLER SHAFT IN A RUBBER STERN TUBE BEARING

A. J. Francken and G. C. vanVelzen Dec. 1980 80 p refs

(Contract A76/KM/134)

(IWECO-5072208-81-Pt-2; TDCK-75125-Pt-2) Avail: NTIS HC A05/MF A01

Lateral shaft vibration was tested by measuring shaft and bearing response to horizontal and vertical excitation. Results show no change in shaft position between the nonrotating and the rotating shaft at speeds up to 120 RPM. Resonance frequencies and driving point mobility deviate $< 3\%$ from reported values. Damping at 120 RPM amounts to 5% of critical damping at both resonances. Author (ESA)

N82-24515# National Aerospace Lab., Amsterdam (Netherlands). Structures and Materials Div.

FLIGHT SIMULATION FATIGUE CRACK PROPAGATION IN SINGLE AND DOUBLE ELEMENT LUGS

R. J. H. Wanhill, A. A. Jongebreur (Royal Netherlands Aircraft Factories Fokker, Schiphol), E. Morgan, and E. J. Moolhuijsen (Delft Univ. of Technology) Oct. 1981 17 p refs Presented at Conf. Fatigue 81, Warwick, England, 24-27 Mar. 1981; sponsored by Soc. of Environ. Engr. Sponsored by Netherlands Agency for Aerospace Programs (NIVR)

(NLR-MP-80023-U) Avail: NTIS HC A02/MF A01

Crack propagation in single and double element lugs made from 2024-T351 and 7075-T7351 aluminum alloys and Ti-6Al-4V titanium alloy was simulated. Initial damage was a through thickness notch at one side of each hole in one element. Results show that crack propagation lives for double element lugs are much longer than those for single element lugs, and that constant amplitude loading shortens crack propagation lives, compared with horizontal stabilizer spectrum loading. Achievement of damage tolerance necessitates reducing design stress levels for safe crack growth. Double element lugs can be qualified as fail-safe damage tolerant without reducing design stress levels. Author (ESA)

N82-24516# Technische Hogeschool, Delft (Netherlands). Lab. of Engineering Mechanics.

A GEOMETRICALLY NONLINEAR FINITE ELEMENT SHELL THEORY Ph.D. Thesis
L. J. Ernst May 1981 265 p refs
(WTHD-132) Avail: NTIS HC A12/MF A01

A curved triangular finite shell element based on expressions for deformation tensors given as Cartesian displacement coordinates is presented. These expressions are derived by considering the element as an originally flat plate with initial curvature. Approximate deformation tensors can be derived in terms of reference positions other than the original, e.g. in cases with arbitrary large displacements and rotations. Shell elasticity is formulated separately for linear and nonlinear theory, both cases using a mixed variational principle. Errors due to interpolation formulas which approximate the independent variables are on the same order of magnitude as errors caused by the approximate description of shell geometry. The linearized equations are verified by computational examples of buckling and postbuckling.
Author (ESA)

N82-24517# Technische Hogeschool, Delft (Netherlands). Lab. of Engineering Mechanics.
NONLINEAR THEORY FOR ELASTIC BEAMS AND RODS AND ITS FINITE ELEMENT REPRESENTATION
J. F. Besseling Oct. 1981 25 p refs
(WTHD-143) Avail: NTIS HC A02/MF A01

Expressions for large curvatures of elastic beams and rods are given in terms of displacement components and angular coordinates. The application of these expressions to bifurcation and stability problems, based on the principle of virtual work is discussed. This approach is compared with another finite element representation, and an error in this representation is corrected. The condition of zero extension of the axis in the case of the Euler column is shown to require division into a large number of finite elements in order to ensure an accurate result for the stability coefficient. The conditions of zero extension of the axis and zero curvature about one principal axis of the cross section in the case of the lateral buckling of the end loaded cantilever have similar consequences. Author (ESA)

42 GEOSCIENCES (GENERAL)

No abstracts in this category.

43 EARTH RESOURCES

Includes remote sensing of earth resources by aircraft and spacecraft; photogrammetry; and aerial photography.
For instrumentation see *35 Instrumentation and Photography*.

N82-24518*# Geological Survey, Denver, Colo.
APPLICATION OF HCMM DATA TO REGIONAL GEOLOGIC ANALYSIS FOR MINERAL AND ENERGY RESOURCE EVALUATION Progress Report, Sep. - Nov. 1981
Kenneth Watson, Principal Investigator and Susanne H. Miller Nov. 1981 4 p Sponsored by NASA HCMM
(E82-10153; NASA-CR-168538; NAS 1.26:168538) Avail: NTIS HC A02/MF A01 CSCL 08G

A more accurate algorithm was developed to compute thermal inertia from temperature difference and albedo information. The error of this algorithm is about 1/3 of the measurement error in HCMM as opposed to the current algorithm which can have an error 5 times larger. A northeast trending lineament was discovered in southewestern Arizona on enhanced thermal inertia images. Author

N82-24519*# Environmental Research Inst. of Michigan, Ann Arbor.
ANALYSIS OF SCANNER DATA FOR CROP INVENTORIES Progress Report, 15 Feb. 30 Jun. 1981
Robert Horvath, Principal Investigator, Richard C. Cicone, Richard J. Kauth, and William A. Malila Aug. 1981 273 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of Interior and Agency for Intern. Develop. ERTS
(Contract NAS9-15476; Proj. AgRISTARS)
(E82-10241; NASA-CR-167391; NAS 1.26:167391; ERIM-152400-6-P) Avail: NTIS HC A12/MF A01 CSCL 02C

Progress and technical issues are reported in the development of corn/soybeans area estimation procedures for use on data from South America, with particular emphasis on Argentina. Aspects related to the supporting research section of the AgRISTARS Project discussed include: (1) multisegment corn/soybean estimation; (2) through the season separability of corn and soybeans within the U.S. corn belt; (3) TTS estimation; (4) insights derived from the baseline corn and soybean procedure; (5) small fields research; and (6) simulating the spectral appearance of wheat as a function of its growth and development. To assist the foreign commodity production forecasting, the performance of the baseline corn/soybean procedure was analyzed and the procedure modified. Fundamental limitations were found in the existing guidelines for discriminating these two crops. The temporal and spectral characteristics of corn and soybeans must be determined because other crops grow with them in Argentina. The state of software technology is assessed and the use of profile techniques for estimation is considered. A.R.H.

N82-24520*# Purdue Univ., Lafayette, Ind. Dept. of Geosciences.
SPHERICAL-EARTH GRAVITY AND MAGNETIC ANOMALY MODELING BY GAUSS-LEGENDRE QUADRATURE INTEGRATION Quarterly Progress Report, Jul. - Sep. 1981
R. R. B. vonFrese, W. J. Hinze, L. W. Braile, and A. J. Luca, Principal Investigators (Chevron Geophysical Co., Calgary, Alberta) 1 Oct. 1981 11 p refs Repr. from J. Geophys. vol. 49, 1981 p 234-242 ERTS
(Contract NAS5-25030)
(E82-10242; NASA-CR-168823; NAS 1.26:168823) Avail: NTIS HC A03/MF A01 CSCL 05B

The anomalous potential of gravity and magnetic fields and their spatial derivatives on a spherical Earth for an arbitrary body represented by an equivalent point source distribution of gravity poles or magnetic dipoles were calculated. The distribution of equivalent point sources was determined directly from the coordinate limits of the source volume. Variable integration limits for an arbitrarily shaped body are derived from interpolation of points which approximate the body's surface envelope. The versatility of the method is enhanced by the ability to treat physical property variations within the source volume and to consider variable magnetic fields over the source and observation surface. A number of examples verify and illustrate the capabilities of the technique, including preliminary modeling of potential field signatures for Mississippi embayment crustal structure at satellite elevations. T.M.

N82-24521*# Geological Survey, Denver, Colo. Petrophysics and Remote Sensing Branch.
APPLICATION OF HCMM DATA TO REGIONAL GEOLOGIC ANALYSIS FOR MINERAL AND ENERGY RESOURCE EVALUATION Progress Report, Mar. - May 1981
Kenneth Watson, Principal Investigator and Susanne H. Miller May 1981 4 p Sponsored by NASA HCMM
(E82-10243; NASA-CR-168824; NAS 1.26:168824) Avail: NTIS HC A02/MF A01 CSCL 08G

The effects of topographic elevation and slope on thermal images were examined using representative field obstructions of the solar and sky radiation and a simple linearized thermal model. The forms are easily adapted for analysis of HCMM images using the DMA digital terrain data. From a representative set of field observations, it was found that flux variations with elevation can cause changes in the mean diurnal temperature gradient from -4 deg to -14 deg per km evaluated at 2000 m. Changes in the temperature difference gradient of 1 to 2 C per km are also produced which is equivalent to an effective thermal inertia gradient of 100 W s to the 1/2 power/sq m K/1 per km. Exposed bedrock on topographic ridges will appear to have a lower thermal inertia due to the additional effect. E.A.K.

N82-24522*# Tokyo Univ. (Japan). Geophysics Research Lab.

INVESTIGATION FROM JAPANESE MAGSAT TEAM. PART A. CRUSTAL STRUCTURE NEAR JAPAN AND IN ANTARCTIC STATION. PART B. ELECTRIC CURRENTS AND HYDROMAGNETIC WAVES IN THE IONOSPHERE AND THE MAGNETOSPHERE Progress Report, 15 Jul. - 15 Nov. 1981

Naoshi Fukushima, Principal Investigator 15 Dec. 1981 13 p refs Sponsored by NASA ERTS

(E82-10244; NASA-CR-168825; NAS 1.26:168825; PR-4) Avail: NTIS HC A02/MF A01 CSCL 05B

Preliminary results of MAGSAT data analysis are described. Regional anomaly maps (deviations from the MGST model field) for X,Y,Z, and F in the area of 115 to 155 deg E and 20 to 60 deg N were obtained. A similar map for the geomagnetic total force anomaly in the vicinity of Japan showed that the observed anomaly can be explained by the difference in crustal magnetization between the Japan Sea and the Japan Island, which reflects a difference of 25 km in the thickness of the magnetized layer. The MAGSAT record of a sudden comencement of a magnetic storm above the South Atlantic Ocean showed a reverse impulse particularly in the D-component. Results relating to toroidal currents in the ionosphere, transverse and parallel perturbations over the polar regions, the relationship between field aligned currents and precipitating electrons, and the calculation of the subsatellite electric field are also discussed. M.G.

N82-24523*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

MULTILEVEL MEASUREMENTS OF SURFACE TEMPERATURE OVER UNDULATING TERRAIN PLANTED TO BARLEY Final Report, 1 Nov. 1977 - 31 Oct. 1980

R. J. Reginato, Principal Investigator (USDA, Phoenix, Ariz.), J. P. Millard, J. L. Hatfield (California Univ., David), and R. D. Jackson (USDA, Phoenix, Ariz.) Mar. 1981 74 p refs Original contains color imagery. Original may be obtained from the EROS Data Center. Sioux Falls, S.D. 57198 ERTS

(NASA Order S-40255-B)

(E82-10245; NASA-CR-168826; NAS 1.26:168826) Avail: NTIS HC A04/MF A01 CSCL 04B

A ground and aircraft program was conducted to extend ground based methods for measuring soil moisture and crop water stress to aircraft and satellite altitudes. A 260ha agricultural field in California was used over the 1977-78 growing season. For cloud free days ground based temperature measurements over bare soil were related to soil moisture content. Water stress resulted from too much water, not from lack of it, as was expected. A theoretical examination of the canopy air temperature difference as affected by vapor pressure deficit and net radiation was developed. This analysis shows why surface temperatures delineate crop water stress under conditions of low humidity, but not under high humidity conditions. Multilevel temperatures acquired from the ground, low and high altitude aircraft, and the Heat Capacity Mapping Mission (HCMM) spacecraft were compared for two day and one night overpasses. The U-2 and low altitude temperatures were within 0.5 C. The HCMM data were analyzed using both the pre- and post-launch calibrations, with the former being considerably closer in agreement with the aircraft data than the latter. M.G.

N82-24524*# Business and Technological Systems, Inc., Seabrook, Md.

MAGSAT SCIENCE INVESTIGATIONS Quarterly Report, 1 Mar. - 31 May 1981

31 May 1981 7 p refs ERTS

(Contract NAS5-26328)

(E82-10246; NASA-CR-168827; NAS 1.26:168827; QR-3) Avail: NTIS HC A02/MF A01 CSCL 05B

A preliminary magnetization model for the U.S. was produced from MAGSAT data. The double grid processing method resulted in a 100 km source spacing. While some spurious features are present in the map, much of the detail appears to be real. The determination of the optional source spacing for inversion of MAGSAT delta B data is in progress. A fine attitude vector data set was obtained for comparison with the theoretical vector field associated with the magnetization model. M.G.

N82-24525*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

LANDSAT REMOTE SENSING: OBSERVATIONS OF AN APPALACHIAN MOUNTAINTOP SURFACE COAL MINING AND RECLAMATION OPERATION

Oct. 1979 7 p ref Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 Original contains color illustrations ERTS

(E82-10247; NASA-TM-84194; NAS 1.15:84194) Avail: NTIS HC A02/MF A01 CSCL 08I

The potential benefits of using LANDSAT remote sensing data by state agencies as an aide in monitoring surface coal mining operations are reviewed. A mountaintop surface mine in eastern Kentucky was surveyed over a 5 year period using satellite multispectral scanner data that were classified by computer analyses. The analyses were guided by aerial photography and by ground surveys of the surface mines procured in 1976. The application of the LANDSAT data indicates that: (1) computer classification of the various landcover categories provides information for monitoring the progress of surface mining and reclamation operations; (2) successive yearly changes in barren and revegetated areas can be qualitatively assessed for surface mines of 100 acres or more of disrupted area; (3) barren areas consisting of limestone and shale mixtures may be recognized, and revegetated areas in various stages of growth may be identified against the hilly forest background. E.A.K.

N82-24526*# Pennsylvania State Univ., University Park. Dept. of Meteorology.

INTERACTIVE INITIALIZATION OF HEAT FLUX PARAMETERS FOR NUMERICAL MODELS USING SATELLITE TEMPERATURE MEASUREMENTS Quarterly Report, 10 Mar. - 31 May 1981

Toby N. Carlson, Principal Investigator 22 May 1981 4 p Sponsored by NASA ERTS

(E82-10248; NASA-CR-168829; NAS 1.26:168829; QR-1) Avail: NTIS HC A02/MF A01 CSCL 04A

Efforts were made (1) to bring the image processing and boundary layer model operation into a completely interactive mode and (2) to test a method for determining the surface energy budget and surface moisture availability and thermal inertia on a scale appreciably larger than that of the city. A region a few hundred kilometers on a side centered over southern Indiana was examined. M.G.

N82-24527*# Stanford Univ., Calif. Remote Sensing Lab.

GEOLOGICAL AND GEOTHERMAL INVESTIGATIONS FOR HCMM-DERIVED DATA Final Report, Jun. 1977 - Jun. 1981

R. J. P. Lyon, A. E. Prelat, and R. Kirk, Principal Investigators Jun. 1981 146 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS

(Contract NAS5-24232)

(E82-10249; NASA-CR-168830; NAS 1.26:168830; SU-SRSL-81-30) Avail: NTIS HC A07/MF A01 CSCL 08G

An attempt was made to match HCMM- and U2HCMR-derived temperature data over two test sites of very local size to similar data collected in the field at nearly the same times. Results indicate that HCMM investigations using resolutions cells of 500 m or so are best conducted with areally-extensive sites, rather than point observations. The excellent quality day-VIS imagery is particularly useful for lineament studies, as is the DELTA-T imagery. Attempts to register the ground observed temperatures (even for 0.5 sq mile targets) were unsuccessful due to excessive pixel-to-pixel noise on the HCMM data. Several computer models were explored and related to thermal parameter value changes with observed data. Unless quite complex models, with many parameters which can be observed (perhaps not even measured (perhaps not even measured) only under remote sensing conditions (e.g., roughness, wind shear, etc) are used, the model outputs do not match the observed data. Empirical relationship may be most readily studied. E.A.K.

N82-24528*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

MONITORING OF REFORESTED AREAS USING LANDSAT

DATA [MONITORAMENTO DE AREAS REFLORESTADAS ATRAVES DOS DADOS DO LANDSAT]
Nelson deJesusParada, Principal Investigator, Pedro Hernandez Filho, and Yosio Edemir Shimabukuro Jun. 1981 50 p refs In PORTUGUESE; ENGLISH summary Presented at the 33d Ann. Meeting of SBPC, Salvador, Bahia, 8-15 Jul. 1981 Sponsored by NASA ERTS
(E82-10250; NASA-CR-168831; NAS 1.26:168831; INPE-2091-RPE/321) Avail: NTIS HC A03/MF A01 CSCL 08B

Imagery obtained with channels 5 and 7 was visually interpreted in an effort to determine the spatial, spectral, and temporal characteristics of a 105,000 hectare area of Fazenda Mutum which was reforested with various species of pine and eucalyptus. It was possible to map a reforested area as small as 6 hectare in its initial implantation using contrast with the surrounding targets. Five classes were mapped: nondeforested areas, partially deforested areas, deforested areas, partially reforested areas, and fully reforested areas. In 1979, 12,000 hectare were deforested, 4,330.83 hectare were partially reforested, and 42,744.71 hectare were reforested. A.R.H.

N82-24529*# Public Technology, Inc., Washington, D. C.
REMOTE SENSING PROCUREMENT PACKAGE: REMOTE SENSING INDUSTRY DIRECTORY
Jun. 1981 272 p ERTS
(Contract NAS13-129)
(E82-10251; NASA-CR-168832; NAS 1.26:168832) Avail: NTIS HC A12/MF A01 CSCL 05B

A directory of over 140 firms and organizations which contains detailed information in the types of products, services and equipment which they offer is presented. Also included for each firm or organization are addresses, phone numbers, contact person(s), and experience in the remote sensing field. T.M.

N82-24530*# Public Technology, Inc., Washington, D. C.
REMOTE SENSING PROCUREMENT PACKAGE: A TECHNICAL GUIDE FOR STATE AND LOCAL GOVERNMENTS
Jun. 1981 268 p ERTS
(Contract NAS13-129)
(E82-10252; NASA-CR-168833; NAS 1.26:168833) Avail: NTIS HC A12/MF A01 CSCL 05B

The guide provides the tools and techniques for procuring remote sensing products and services. It is written for administrators, procurement officials and line agency staff who are directly involved in identifying information needs; defining remote sensing project requirements; soliciting and evaluating contract responses and negotiating, awarding, and administering contracts. T.M.

N82-24531*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex.
SELECTION OF USSR FOREIGN SIMILARITY REGIONS
J. M. Disler, Principal Investigator Jan. 1982 79 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of Interior, and Agency for International Development ERTS
(Contract NAS9-15800; Proj. AgRISTARS)
(E82-10253; NASA-CR-167552; JSC-16845; NAS 1.26:167552; IT-L0-04020; MSCO-15643) Avail: NTIS HC A05/MF A01 CSCL 02C

The similarity regions in the United States and Canada were selected to parallel the conditions that affect labeling and classification accuracies in the U.S.S.R. indicator regions. In addition to climate, a significant condition that affects labeling and classification accuracies in the U.S.S.R. is the proportion of barley and wheat grown in a given region (based on sown areas). The following regions in the United States and Canada were determined to be similar to the U.S.S.R. indicator regions: (1) Montana agrophysical unit (APU) 104 corresponds to the Belorussia high barley region; (2) North Dakota and Minnesota APU 20 and secondary region southern Manitoba and Saskatchewan correspond to the Ural RSFSR barley and spring wheat region; (3) Montana APU 23 corresponds to he North Caucasus barley and winter wheat region. Selection criteria included climates, crop type, crop distribution, growth cycles, field sizes, and field shapes. M.G.

N82-24532*# Electromagnetic Systems Labs., Inc., Sunnyvale, Calif.
NASA/BLM APPLICATIONS PILOT TEST (APT), PHASE 2. VOLUME 1: EXECUTIVE SUMMARY Final Report
8 Jan. 1981 85 p ERTS 3 Vol.
(Contract NAS9-15740)
(E82-10254; NASA-CR-167428; NAS 1.26:167428) Avail: NTIS HC A05/MF A01 CSCL 08B

Data from LANDSAT, low altitude color aerial photography, and ground visits were combined and used to produce vegetation cover maps and to estimate productivity of range, woodland, and forest resources in northwestern Arizona. A planning session, two workshops, and four status reviews were held to assist technology transfer from NASA. Computer aided digital classification of LANDSAT data was selected as a major source of input data. An overview is presented of the data processing, data collection, productivity estimation, and map verification techniques used. Cost analysis and digital LANDSAT digital products are also considered. A.R.H.

N82-24533*# Electromagnetic Systems Labs., Inc., Sunnyvale, Calif.
NASA/BLM APT, PHASE 2. VOLUME 2: TECHNOLOGY DEMONSTRATION Final Report
8 Jan. 1981 471 p refs ERTS 3 Vol.
(Contract NAS9-15740)
(E82-10255; NASA-CR-167427; NAS 1.26:167427) Avail: NTIS HC A20/MF A01 CSCL 08B

Techniques described include: (1) steps in the preprocessing of LANDSAT data; (2) the training of a classifier; (3) maximum likelihood classification and precision; (4) geometric correction; (5) class description; (6) digitizing; (7) digital terrain data; (8) an overview of sample design; (9) allocation and selection of primary sample units; (10) interpretation of secondary sample units; (11) data collection ground plots; (12) data reductions; (13) analysis for productivity estimation and map verification; (14) cost analysis; and (150) LANDSAT digital products. The evaluation of the pre-inventory planning for P.J. is included. A.R.H.

N82-24534*# Electromagnetic Systems Labs., Inc., Sunnyvale, Calif.
NASA/BLM APPLICATIONS PILOT TEST (APT), PHASE 2. VOLUME 3: TECHNOLOGY TRANSFER Final Report
8 Jan. 1981 134 p ERTS 3 Vol.
(Contract NAS9-15740)
(E82-10256; NASA-CR-167429; NAS 1.26:167429) Avail: NTIS HC A07/MF A01 CSCL 08B

Techniques used and materials presented at a planning session and two workshops held to provide hands-on training in the integration of quantitatively based remote sensing data are described as well as methods used to enhance understanding of approaches to inventories that integrate multiple data sources given various resource information objectives. Significant results from each of the technology transfer sessions are examined. A.R.H.

N82-24535*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SOIL MOISTURE VARIATION PATTERNS OBSERVED IN HAND COUNTY, SOUTH DAKOTA
E. Bruce Jones (Resource Consultants, Inc., Fort Collins, Colo.), Manfred Owe, and Thomas J. Schmugge, Principal Investigators Aug. 1981 35 p refs Submitted for publication Sponsored by NASA, USDA, Dept. of Commerce, Dept. of Interior, and Agency for International Development ERTS
(Proj. AgRISTARS)
(E82-10257; NASA-TM-82171; NAS 1.15:82171; SM-GI-04129) Avail: NTIS HC A03/MF A01 CSCL 08M

Soil moisture data were taken during 1976 (April, June, October), 1977 (April, May, June), and 1978 (May, June, July) Hand County, South Dakota as part of the ground truth used in NASA's aircraft experiments to study the use of microwave radiometers for the remote sensing of soil moisture. The spatial variability observed on the ground during each of the sampling events was studied. The data reported are the mean gravimetric soil moisture contained in three surface horizon depths: 0 to 2.5, 0 to 5 and 0 to 10 cm. The overall moisture levels ranged

from extremely dry conditions in June 1976 to very wet in May 1978, with a relatively even distribution of values within that range. It is indicated that well drained sites have to be partitioned from imperfectly drained areas when attempting to characterize the general moisture profile throughout an area of varying soil and cover type conditions. It is also found that the variability in moisture content is greatest in the 0 to 2.5 cm measurements and decreases as the measurements are integrated over a greater depth. It is also determined that the sampling intensity of 10 measurements per km is adequate to estimate the mean moisture with an uncertainty of + or - 3 percent under average moisture conditions in areas of moderate to good drainage. E.A.K.

N82-24536*# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.

CULTURAL AND ENVIRONMENTAL EFFECTS ON THE SPECTRAL DEVELOPMENT PATTERNS OF CORN AND SOYBEANS: FIELD DATA ANALYSIS Technical Report, 15 Nov. 1980 - 14 Nov. 1981

E. P. Crist, Principal Investigator Jan. 1982 67 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of Interior, and Agency for International Development Prepared in cooperation with California Univ., Berkeley ERTS
(Contract NAS9-15476; Proj. AgRISTARS)
(E82-10258; NASA-CR-167578; NAS 1.26:167578; SR-E2-04224; ERIM-152400-20-T) Avail: NTIS HC A04/MF A01 CSCL 02C

An overall approach to crop spectral understanding is presented which serves to maintain a strong link between actual plant responses and characteristics and spectral observations from ground based and spaceborne sensors. A specific technique for evaluating field reflectance data, as a part of the overall approach, is also described. Results of the application of this technique to corn and soybeans reflectance data collected by and at Purdue/LARS indicate that a number of common cultural and environmental factors can significantly affect the temporal spectral development patterns of these crops in tasseled cap greenness (a transformed variable of LANDSAT MSS signals). Author

N82-24537*# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.

THE EXTENSION OF A UNIFORM CANOPY REFLECTANCE MODEL TO INCLUDE ROW EFFECTS

Gwynn H. Suits, Principal Investigator Dec. 1981 41 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of Interior, and Agency for International Development Prepared in cooperation with California Univ., Berkeley ERTS
(Contract NAS9-15476; Proj. AgRISTARS)
(E82-10259; NASA-CR-167530; NAS 1.26:167530; SR-E1-04065; ERIM-152400-17-T) Avail: NTIS HC A03/MF A01 CSCL 02C

The effect of row structure is assumed to be caused by the variation in density of vegetation across rows rather than to a profile in canopy height. The calculation of crop reflectance using vegetation density modulation across rows follows a parallel procedure to that for a uniform canopy. Predictions using the row model for wheat show that the effect of changes in sun to row azimuth are greatest in LANDSAT Band 5 (red band) and can result in underestimation of crop vigor. T.M.

N82-24538*# Texas A&M Univ., College Station. Remote Sensing Center.

MICROWAVE SOIL MOISTURE MEASUREMENTS AND ANALYSIS Final Report

R. W. Newton, T. A. Howell, J. L. Nieber, and C. H. M. vanBavel, Principal Investigators May 1980 398 p refs Original contains color illustrations ERTS
(Contract NAS9-13904)
(E82-10260; NASA-CR-167517; NAS 1.26:167517; RSC-3058) Avail: NTIS HC A17/MF A01 CSCL 08M

An effort to develop a model that simulates the distribution of water content and of temperature in bare soil is documented. The field experimental set up designed to acquire the data to test this model is described. The microwave signature acquisition system (MSAS) field measurements acquired in Colby, Kansas during the summer of 1978 are pesented. J.D.

N82-24539*# SBC Data Analyis, Delmar, N.Y.

ANALYSIS OF URBAN AREA LAND COVER USING SEASAT SYNTHETIC APERTURE RADAR DATA Final Report, Mar. - Dec. 1980

Floyd M. Henderson, Principal Investigator Nov. 1980 59 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS
(Contract NAS5-26032)
(E82-10261; NASA-CR-166723; NAS 1.26:166723) Avail: NTIS HC A04/MF A01 CSCL 13B

Digitally processed SEASAT synthetic aperture raar (SAR) imagery of the Denver, Colorado urban area was examined to explore the potential of SAR data for mapping urban land cover and the compatability of SAR derived land cover classes with the United States Geological Survey classification system. The imagery is examined at three different scales to determine the effect of image enlargement on accuracy and level of detail extractable. At each scale the value of employing a simplistic preprocessing smoothing algorithm to improve image interpretation is addressed. A visual interpretation approach and an automated machine/visual approach are employed to evaluate the feasibility of producing a semiautomated land cover classification from SAR data. Confusion matrices of omission and commission errors are employed to define classification accuracies for each interpretation approach and image scale. M.G.

N82-24540*# Florida Univ., Gainesville. Remote Sensing Applications Lab.

HYDRAULICS AND GEOLOGY RELATED TO BEACH RESTORATION IN LEE COUNTY, FLORIDA

Trevor Winton, Principal Investigator, H. Kelly Brooks, Janet Degner, and Byron Ruth Jul. 1981 129 p refs Sponsored by NASA Original contains color imagery. Original photography may be purchased from the EROS Data Center. Sioux Falls, S.D. 57198 ERTS
(E82-10262; NASA-CR-168870; NAS 1.26:168870) Avail: NTIS HC A07/MF A01 CSCL 13B

The erosion problem on Captiva Island is discussed. It is due to a deficit in the sand budget of the littoral drift system; a system with losses due to attrition of the particles and mass losses into the lagoons, to offshore, and to lateral transport. The effect that reopening Blind Pass would have, and the placement of sediment retaining structures in the surf zone at the northern and southern limits of the Captiva beach system, wave examined. A geological approach was used to study the origin and dynamic changes that have occurred. Through hydraulic modeling, changes that will occur by reopening and stabilizing Blind Pass are predicted. It is concluded that if the island is to be stabilized, beach nourishment with proper amounts and particle size is a necessity and that jetties adequate to restrict lateral and offshore losses are essential. It is shown that the reopening of Blind Pass would have minimal effects on the passes to the north and south, and would improve the environmental conditions in the sound with no adverse effects on the beach system. T.M.

N82-24541*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex.

FISCAL YEAR 1981 US CORN AND SOYBEANS PILOT PRELIMINARY EXPERIMENT PLAN, PHASE 1

G. P. Livingston, K. S. Nedelman, D. F. Norwood, and J. H. Smith, Principal Investigators Dec. 1981 153 p Sponsored by NASA, USDA, Dept. of Commerce, Dept. of Interior, and Agency for International Development ERTS
(Contract NAS9-15800; Proj. AgRISTARS)
(E82-10263; NASA-CR-167547; JSC-17151; NAS 1.26:167547; FC-L1-04109; LEMSCO-16575) Avail: NTIS HC A08/MF A01 CSCL 02C

A draft of the preliminary experiment plan for the foreign commodity production forecasting project fiscal year 1981 is presented. This draft plan includes: definition of the phase 1 and 2 U.S. pilot objectives; the proposed experiment design to evaluate crop calendar, area estimation, and area aggregation components for corn and soybean technologies using 1978/1979 crop-year data; a description of individual sensitivity evaluations of the baseline corn and soybean segment classification procedure; and technology and data assessment in support of the corn and

soybean estimation technology for use in the U.S. central corn belt. J.D.

N82-24542*# Department of Agriculture, Weslaco, Tex. Soil and Water Conservation Research.
REFLECTANCE OF LITTER ACCUMULATION LEVELS AT FIVE WAVELENGTHS WITHIN THE 0.5- TO 2.5 MICRON WAVEBAND
A. H. Gerbermann, J. H. Everitt, and H. W. Gausman, Principal Investigators Mar. 1982 10 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of Interior, and Agency for International Development ERTS
(Proj. AgRISTARS)
(E82-10264; NASA-CR-168872; JSC-17825;
NAS 1.26.168872; EW-U2-04252) Avail: NTIS HC A02/MF A01 CSCL 02C

Reflectance was measured for 1-m2 range grass plots with two canopy treatments (standing and clipped) and four levels of litter accumulation and for grain sorghum with two canopy treatments. Reflectance was significantly higher at the 0.65- to 1.65-, and 2.20-micrometer. Wavelengths for both grass and grain sorghum canopies when the canopies were clipped and the resulting litter was removed. The natural accumulation of litter under the grass canopy did not significantly affect reflectance. The 1.65- and 2.20-micrometer wavelength reflectances of the live grass and the intact litter were 21.8% and 16.2%, respectively, and those of grain sorghum were 21.8% and 16.5%, respectively. T.M.

N82-24543*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
CRITERIA FOR THE USE OF REGRESSION ANALYSIS FOR REMOTE SENSING OF SEDIMENT AND POLLUTANTS
Charles H. Whitlock, Chin Y. Kuo (Virginia Polytechnic Inst. and State Univ.), and Stuart R. LeCroy, Principal Investigators (Kentron International, Inc.) Feb. 1982 36 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of Interior, and Agency for International Development ERTS
(Proj. AgRISTARS)
(E82-10266; NASA-CR-168874; JSC-17823;
NAS 1.26.168874; EW-U2-04250) Avail: NTIS HC A02/MF A01

Data analysis procedures for quantification of water quality parameters that are already identified and are known to exist within the water body are considered. The liner multiple-regression technique was examined as a procedure for defining and calibrating data analysis algorithms for such instruments as spectrometers and multispectral scanners. T.M.

N82-24544*# Department of Agriculture, Weslaco, Tex.
REFLECTANCE DIFFERENCES BETWEEN TARGET AND TORCH RAPE CULTIVARS
H. W. Gausman and R. W. Leamer, Principal Investigators Mar. 1982 7 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of Interior, and Agency for International Development ERTS
(Proj. AgRISTARS)
(E82-10266; NASA-CR-168874; NAS 1.26:168874;
EW-U2-04250; JSC-17823) Avail: NTIS HC A02/MF A01 CSCL 02C

Spectroradiometric reflectance measurements were made on Target and Torch plants (four and five leaves, respectively) that were growing in 0.09 sq m soil-containing flats. Torch's spectrophotometric single leaf reflectance was consistently lower than Target's at the 650-nm chlorophyll absorption band because Torch's chlorophyll concentration was larger than Target's, which caused more red light absorption. Spectroradiometric measurements indicate that: wet soil strongly absorbs visible light (500 to 700 nm) so that Target's soil-containing flat with 60% plant cover has less reflectance than Torch's soil-containing flat with 75% plant cover; Torch (most foiliage) has higher near-infrared (750 to 1,350 nm) reflectane than Target (least foliage); and the 2,200-nm wavelength is a candidate band to distinguish Target from Torch. The difference in chlorophyll concentrations between Target and Torch, compared with leaf structural differences, is apparently the most important factor that would affect the infrared color film's tonal response to vegetation in the photographic sensitive region (500 to 900 nm). T.M.

N82-24545*# Department of Agriculture, Weslaco, Tex.
LEAF REFLECTANCE-NITROGEN-CHLOROPHYLL RELATIONS AMONG THREE SOUTH TEXAS WOODY RANGELAND PLANT SPECIES
H. W. Gausman, J. H. Everitt, and D. E. Escobar, Principal Investigators Feb. 1982 8 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of Interior, and Agency for International Development ERTS
(Proj. AgRISTARS)
(E82-10267; NASA-CR-168873; JSC-17824;
NAS 1.26:168873; EW-U2-0451) Avail: NTIS HC A02/MF A01 CSCL 02C

Annual variations in the nitrogen-chlorophyll leaf reflectance of hackberry, honey mesquite and live oak in south Texas, were compared. In spring, leaf reflectance at the 0.55 m wavelength and nitrogen (N) concentration was high but leaf chlorophyll (chl) concentrations were low. In summer, leaf reflectance and N-concentration were low but lead chl concentrations were high. Linear correlations for both spring and summer of leaf reflectance with N and chl concentration or deviations from linear regression were not statistically significant. E.A.K.

N82-24546*# Agricultural Research Service, Weslaco, Tex.
OPTICAL PARAMETERS OF LEAVES OF SEVEN WEED SPECIES
H. W. Gausman, R. M. Menges, A. J. Richardson, H. Walter, R. R. Rodriguez, and S. Tamez, Principal Investigators Mar. 1982 6 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of Interior and Agency for International Development ERTS
(NASA Order S-53876-AG; Proj. AgRISTARS)
(E82-10268; NASA-CR-168871; JSC-17826;
NAS 1.26:168871; EW-U2-04253) Avail: NTIS HC A02/MF A01 CSCL 02C

Absorption coefficient (k), infinite reflectance (R inf.) and scattering coefficient (s) were tabulated for five wavelengths and analyzed for statistical differences for seven weed species. The wavelengths were: 0.55, 0.65, 0.85, 1.65, and 2.20 microns. The R inf. of common lambsquarters (Chenopodium album L.), johnsongrass (Sorghum halepense L. Pers.), and annual sowthistle (Sonchus oleraceus L.) leaves at the 0.85 micron wavelength were significantly ($p = 0.05$) higher than for sunflower (Helianthus annuus L.), ragweed parthenium (parthenium hysterophorus L.), or London rocket (Sisymbrium irio L.). Annual sowthistle had the largest k value, and Palmer amaranth (Amaranthus palmeri S. Wats.) had the smallest k value at the 0.65 micron chlorophyll absorption wavelength. In general, johnsongrass, ragweed parthenium, and London rocket had the largest s values among the five wavelengths, whereas annual sowthistle and Palmer amaranth were usually lowest. M.G.

N82-24547*# Agricultural Research Service, Weslaco, Tex. Soil and Water Conservation Research.
USE OF LANDSAT 2 DATA TECHNIQUE TO ESTIMATE SILVERLEAF SUNFLOWER INFESTATION
A. J. Richardson, D. E. Escobar, H. W. Gausman, and J. H. Everitt, Principal Investigators Feb. 1982 16 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of Interior, and Agency for International Development Original contains imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS
(Proj. AgRISTARS)
(E82-10269; NASA-CR-168875; JSC-17827;
NAS 1.26:168875; EW-U2-04254) Avail: NTIS HC A02/MF A01 CSCL 02C

The feasibility of the technique using the Earth Resources Technology Satellite (LANDSAT-2) multispectral scanner (MSS) was tested; to distinguish silverleaf sunflowers (Helianthus argophyllus Torr. and Gray) from other plant species and to estimate the hectarage percent of its infestation. Sunflowers gave high mean digital counts in all four LANDSAT MSS bands that were manifested as a pinkish image response on the LANDSAT color composite imagery. Photo- and LANDSAT-estimated hectare percentages for silverleaf sunflower within a 23,467 ha study area were 9.1 and 9.5%, respectively. The geographic occurrence of sunflower areas on the line-printer recognition map was in good agreement with their known aerial photographic locations. E.A.K.

N82-24548*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex.

GENERAL MULTIYEAR AGGREGATION TECHNOLOGY: METHODOLOGY AND SOFTWARE DOCUMENTATION

T. C. Baker, Principal Investigator Mar. 1982 45 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development
(cnt Contract NAS9-15800; Proj. AgRISTARS)
(E82-10270; NASA-CR-167597; IT-L2-04228; JSC-17814; NAS 1.26:167597; LEMSCO-17153) Avail: NTIS HC A03/MF A01 CSCL 02C

A general methodology is presented for estimating a stratum's at-harvest crop acreage proportion for a given crop year (target year) from the crop's estimated acreage proportion for sample segments from within the stratum. Sample segments from crop years other than the target year are (usually) required for use in conjunction with those from the target year. In addition, the stratum's (identifiable) crop acreage proportion may be estimated for times other than at-harvest in some situations. A by-product of the procedure is a methodology for estimating the change in the stratum's at-harvest crop acreage proportion from crop year to crop year. An implementation of the proposed procedure as a statistical analysis system routine using the system's matrix language module, PROC MATRIX, is described and documented. Three examples illustrating use of the methodology and algorithm are provided. M.G.

N82-24549*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex.

SELECTION OF THE ARGENTINE INDICATOR REGION

C. J. Ramirez and C. R. Reed, Principal Investigators Mar. 1982 100 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS
(Contract NAS9-15800; Proj. AgRISTARS)
(E82-10271; NASA-CR-167596; IT-L1-04132; JSC-14708; NAS 1.26:167596; LEMSCO-16874) Avail: NTIS HC A05/MF A01 CSCL 02C

Determined from available Argentine crop statistics, selection of the Indicator Region was based on the highest wheat, corn, and soybean producing provinces, which were: Buenos Aires, Cordoba, Entre Rios, and Santa Fe. Each province in Argentina was examined for the availability of LANDSAT data; area, yield and production statistics; crop calendars; and other ancillary data. The Argentine Indicator Region is described. T.M.

N82-24550*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

A MULTI-FREQUENCY MEASUREMENT OF THERMAL MICROWAVE EMISSION FROM SOILS: THE EFFECTS OF SOIL TEXTURE AND SURFACE ROUGHNESS

J. R. Wang, P. E. ONeill, T. J. Jackson, and E. T. Engman, Principal Investigators Dec. 1981 33 p refs Submitted for publication Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development Prepared in cooperation with Agricultural Research Service, Beltsville, Md. ERTS
(Proj. AgRISTARS)
(E82-10272; NASA-TM-83880; SM-G1-04218; NAS 1.15:83880) Avail: NTIS HC A03/MF A01 CSCL 08M

An experiment on remote sensing of soil moisture content was conducted over bare fields with microwave radiometers at the frequencies of 1.4 GHz, 5 GHz, and 10.7 GHz during July - September of 1981. Three bare fields with different surface roughnesses and soil textures were prepared for the experiment. Ground truth acquisition of soil temperatures and moisture contents for 5 layers down to the depths of 15 cm was made concurrently with radiometric measurements. The experimental results show that the effect of surface roughness is to increase the soils' brightness temperature and to reduce the slope of regression between brightness temperature and moisture content. The slopes of regression for soils with different textures are found to be comparable, and the effect of soil texture is reflected in the difference of regression line intercepts at brightness temperature axis. The result is consistent with laboratory measurement of soils' dielectric permittivity. Measurements on wet smooth bare fields give lower brightness temperatures at 5 GHz than at 1.4 GHz. T.M.

N82-24551*# Kentron International, Inc,, Hampton, Va.

DETERMINATION OF CIRCULATION AND TURBIDITY PATTERNS IN KERR LAKE FROM LANDSAT MSS IMAGERY

Stuart R. LeCroy, Principal Investigator Nov. 1981 42 p refs Sponsod by NASA, USDA, Dept. of Commerce, Dept. of Interior, and Agency for International Development Original contains imagery. Original photography may be obtained from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS
(Contract NAS9-16000; Proj. AgRISTARS)
(E82-10273; NASA-CR-167598; NAS 1.26:167598; CP-32-04238) Avail: NTIS HC A03/MF A01 CSCL 02C

The LANDSAT imagery was historically analyzed to determine the circulation and turbidity patterns of Kerr Lake, located on the Virginia-North Carolina border. By examining the seasonal and regional turbidity and circulation patterns, a record of sediment transport and possible disposition can be obtained. Sketches were generated, displaying different intensities of brightness observed in bands 5 and 7 of LANDSAT's multispectral scanner data. Differences in and between bands 5 and 7 indicate variances in the levels of surface sediment concentrations. High sediment loads are revealed when distinct patterns appear in the band 7 imagery. The upwelled signal is exponential in nature and saturates in band 5 at low wavelengths for large concentrations of suspended solids. E.A.K.

N82-24552*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex.

REGRESSION MODEL ESTIMATION OF EARLY SEASON CROP PROPORTIONS: NORTH DAKOTA, SOME PRELIMINARY RESULTS

Karl K. Lin, Principal Investigator Jan. 1982 139 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior and Agency for International Development ERTS
(Contract NAS9-15800; Proj. AgRISTARS)
(E82-10274; NASA-CR-167567; SR-L1-0415; JSC-17429; NAS 1.26:167567; LEMSCO-17156) Avail: NTIS HC A07/MF A01 CSCL 02C

To estimate crop proportions early in the season, an approach is proposed based on: use of a regression-based prediction equation to obtain an a priori estimate for specific major crop groups; modification of this estimate using current-year LANDSAT and weather data; and a breakdown of the major crop groups into specific crops by regression models. Results from the development and evaluation of appropriate regression models for the first portion of the proposed approach are presented. The results show that the model predicts 1980 crop proportions very well at both county and crop reporting district levels. In terms of planted acreage, the model underpredicted 9.1 percent of the 1980 published data on planted acreage at the county level. It predicted almost exactly the 1980 published data on planted acreage at the crop reporting district level and overpredicted the planted acreage by just 0.92 percent. T.M.

N82-24553*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex.

AREA ESTIMATION OF ENVIRONMENTAL PHENOMENA FROM NOAA-n SATELLITE DATA

G. Tappan, Principal Investigators and G. E. Miller Feb. 1982 39 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS
(Contract NAS9-15800; Proj. AgRISTARS)
(E82-10275; NASA-CR-167569; EW-L1-04190; JSC-17437; NAS 1.26:167569; LEMSCO-17312) Avail: NTIS HC A03/MF A01 CSCL 02C

A technique for documenting changes in size of NOAA-n pixels in order to calibrate the data for use in performing area calculations is described. Based on Earth-satellite geometry, a function for calculating the effective pixel size, measured in terms of ground area, on any given pixel was derived. The equation is an application of the law of sines plus an arclength formula. Effective pixel dimensions for NOAA 6 and 7 satellites for all pixels between nadir and the extreme view angles are presented. The NOAA 6 data were used to estimate the areas of several lakes, with an accuracy within 5%. Sources of error are discussed. J.D.

N82-24554*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex.
EVALUATION OF THE PROCEDURE 1A COMPONENT OF THE 1980 US/CANADA WHEAT AND BARLEY EXPLORATORY EXPERIMENT
G. M. Chapman, Principal Investigators and J. G. Carnes Dec. 1981 47 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS
(Contract NAS9-15800; Proj. AgRISTARS)
(E82-10276; NASA-CR-167566; FC-L1-04219; JSC-17806; NAS 1.26:167566; LEMSCO-16311) Avail: NTIS HC A03/MF A01 CSCL 02C

Several techniques which use clusters generated by a new clustering algorithm, CLASSY, are proposed as alternatives to random sampling to obtain greater precision in crop proportion estimation: (1) Proportional Allocation/relative count estimator (PA/RCE) uses proportional allocation of dots to clusters on the basis of cluster size and a relative count cluster level estimate; (2) Proportional Allocation/Bayes Estimator (PA/BE) uses proportional allocation of dots to clusters and a Bayesian cluster-level estimate; and (3) Bayes Sequential Allocation/Bayesian Estimator (BSA/BE) uses sequential allocation of dots to clusters and a Bayesian cluster level estimate. Clustering in an effective method in making proportion estimates. It is estimated that, to obtain the same precision with random sampling as obtained by the proportional sampling of 50 dots with an unbiased estimator, samples of 85 or 166 would need to be taken if dot sets with AI labels (integrated procedure) or ground truth labels, respectively were input. Dot reallocation provides dot sets that are unbiased. It is recommended that these proportion estimation techniques are maintained, particularly the PA/BE because it provides the greatest precision. E.A.K.

N82-24555*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex.
A REVIEW OF REMOTE SENSING AND GRASSLANDS LITERATURE
G. Tappan and M. C. Kinsler, Principal Investigators Feb. 1982 30 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS
(Contract NAS9-15800; Proj. AgRISTARS)
(E82-10277; NASA-CR-167553; EW-L2-04223; JSC-17809; NAS 1.26:167553; LEMSCO-17644) Avail: NTIS HC A03/MF A01 CSCL 02C

Studies between 1971 and 1980 dealing with remote sensing of rangelands/grasslands in the multispectral band are summarized and evaluated. Vegetation and soil reflectance properties are described. In the majority of the studies, the effect of the reflectance of green rangelands vegetation on the reflectance from the total scene is the primary concern. Developments in technique are summarized and recommendations for further research are presented. J.D.

N82-24556*# Lockheed Engineering and Management Services Co., Inc., Houston, Tex.
EVALUATION OF THE US/CANADA WHEAT AND BARLEY EXPLORATORY EXPERIMENT SHAKEDOWN TEST ANALYST LABELING RESULTS
J. G. Carnes, Principal Investigator Dec. 1981 72 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS
(Contract NAS9-15800; Proj. AgRISTARS)
(E82-10278; NASA-CR-167574; FC-L2-04229; JSC-17815; NAS 1.26:167574; LEMSCO-16633) Avail: NTIS HC A04/MF A01 CSCL 02C

Labeling accuracies using the reformatted labeling procedure are evaluated. The procedure is described and the decision logic applied to six LANDSAT segments from the 1978 crop year. Small grains and nonsmall grains are labeled, and small grains differentiated from barley. An error analysis was performed. Recommended changes to the reformatted procedure are presented. J.D.

N82-24557*# Kansas Univ. Center for Research, Inc., Lawrence. Remote Sensing Lab.
AGRISTARS. SUPPORTING RESEARCH: MARS X-BAND SCATTEROMETER
Fawwaz T. Ulaby, Principal Investigator, Paul F. Gabel, Jr., and David R. Brunfeldt Nov. 1981 142 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of the Interior, and Agency for International Development ERTS
(NAS9-15421; Proj. AgRISTARS)
(E82-10279; NASA-CR-167525; SR-K1-04213; NAS 1.26:167525; RSL-TR-360-14) Avail: NTIS HC A07/MF A01 CSCL 14B

The design, construction, and data collection procedures of the mobile agricultural radar sensor (MARS) x band scatterometer are described. This system is an inexpensive, highly mobile, truck mounted FM-CW radar operating at a center frequency of 10.2 GHz. The antennas, which allow for VV and VH polarizations, are configured in a side looking mode that allows for drive by data collection. This configuration shortens fieldwork time considerably while increasing statistical confidence in the data. Both internal calibration, via a delay line, and external calibration with a Luneberg lens are used to calibrate the instrument in terms of sigma(o). The radar scattering cross section per unit area, sigma(o), is found using the radar equation. M.G.

N82-24558*# Research Triangle Inst., Research Triangle Park, N. C. Office of Geosciences Programs.
A COMPARISON OF HCMM SURFACE TEMPERATURES WITH IN SITU TEMPERATURE DATA Quarterly Progress Report
Apr. 1982 4 p HCMM
(Contract NAS5-26863)
(E82-10280; NASA-CR-168915; NAS 1.26:168915) Avail: NTIS HC A02/MF A01 CSCL 08B

Algorithms were updated for a quicker analysis of computer compatible tapes in an effort to establish the absolute and relative accuracy of HCMM infrared data. Data for four case studies were identified and extracted from the tapes. These studies include three dates for the Nantucket Shoals region and one date for the Gulf of Mexico region. Upper air meteorological data, which are needed to make atmospheric correction of the HCMM data, are being reduced and prepared for calculation of the atmospheric effect. A.R.H.

N82-24559*# Kansas Univ. Center for Research, Inc., Lawrence. Remote Sensing Lab.
CROP CLASSIFICATION USING MULTIDATE/MULTIFREQUENCY RADAR DATA
F. T. Ulaby, Principal Investigator, K. Sam Shanmugam, V. Narayanan, and C. Dobson Dec. 1981 52 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of Interior, and Agency for International Development ERTS
(Contract NAS9-15421; Proj. AgRISTARS)
(E82-10281; NASA-CR-167523; SR-K2-04220; NAS 1.26:167523; RSL-TR-360-17) Avail: NTIS HC A04/MF A01 CSCL 02C

Both C- and L-band radar data acquired over a test site near Colby, Kansas during the summer of 1978 were used to identify three types of vegetation cover and bare soil. The effects of frequency, polarization, and the look angle on the overall accuracy of recognizing the four types of ground cover were analyzed. In addition, multidate data were used to study the improvement in recognition accuracy possible with the addition of temporal information. The soil moisture conditions had changed considerably during the temporal sequence of the data; hence, the effects of soil moisture on the ability to discriminate between cover types were also analyzed. The results provide useful information needed for selecting the parameters of a radar system for monitoring crops. Author

N82-24560*# Kansas Univ. Center for Research, Inc., Lawrence. Remote Sensing Lab.
COHERENT OPTICAL DETERMINATION OF THE LEAF ANGLE DISTRIBUTION OF CORN
Fawwaz T. Ulaby, Principal Investigator and Michael Pihlman Dec. 1981 151 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of Interior, and Agency for International Development ERTS
(Contract NAS9-15421; Proj. AgRISTARS)
(E82-10282; NASA-CR-167522; SR-K1-04214; NAS 1.26:167522; RSL-TR-360-15) Avail: NTIS

HC A08/MF A01 CSCL 02C

A coherent optical technique for the diffraction analysis of an image is presented. Developments in radar remote sensing shows a need to understand plant geometry and its relationship to plant moisture, soil moisture, and the radar backscattering coefficient. A corn plant changes its leaf angle distribution, as a function of time, from a uniform distribution to one that is strongly vertical. It is shown that plant and soil moisture may have an effect on plant geometry. E.A.K.

N82-24561*# Environmental Research Inst. of Michigan, Ann Arbor.

AGRONOMIC CHARACTERIZATION OF THE ARGENTINA INDICATOR REGION

David R. Hicks, Principal Investigator Jan. 1982 132 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of Interior, and Agency for International Development ERTS
(Contract NAS9-15476; Proj. AgRISTARS)
(E82-10283; NASA-CR-167576; SR-E2-04222; NAS 1.26:167576; ERIM-152400-19-T) Avail: NTIS HC A07/MF A01 CSCL 02C

An overview of the Argentina indicator region including information on topography, climate, soils and vegetation is presented followed by a regionalization of crop livestock land use. Corn/soybean production and exports as well as agricultural practices are discussed. Similarities and differences in the physical agronomic scene, crop livestock land use and agricultural practices between the U.S. corn belt and the Argentine pampa are considered. The Argentine agricultural economy is described. Crop calendars for the Argentina indicator region, an accompanying description, notes on crop-livestock zones, wheat production, field size, and agricultural problems and practices are included. E.A.K.

N82-24562*# Kansas Univ. Center for Research, Inc., Lawrence. Remote Sensing Lab.

WITHIN-FIELD VARIABILITY OF PLANT AND SOIL PARAMETERS

Fawwaz T. Ulaby, Principal Investigator, Brian Brisco, and Craig Dobson Dec. 1981 43 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of Interior, and Agency for International Development ERTS
(Contract NAS9-15421; Proj. AgRISTARS)
(E82-10284; NASA-CR-167573; SR-K2-04227; NAS 1.26:167573; SL-TR-360-16) Avail: NTIS HC A03/MF A01 CSCL 02C

The variability of ground truth data collected for vegetation experiments was investigated. Two fields of wheat and one field of corn were sampled on two different dates. The variability of crop and soil parameters within a field, between two fields of the same type, and within a field over time were compared statistically. The number of samples from each test site required in order to be able to determine with confidence the mean and standard deviations for a given variable was determined. Eight samples were found to be adequate for plant height determinations, while twenty samples were required for plant moisture and soil moisture characterization. Eighteen samples were necessary for detecting within field variability over time and for between field variability for the same crop. The necessary sample sites vary according to the physiological growth stage of the crop and recent weather events that affect the moisture and/or height characteristics of the field in question. J.D.

N82-24563*# National Aeronautics and Space Administration. National Space Technology Labs., Bay Saint Louis, Miss.

AN ANALYSIS OF LANDSAT MSS SCENE-TO-SCENE REGISTRATION ACCURACY

Benjamin R. Seyfarth and Paul W. Cook, Principal Investigators (USDA) Dec. 1981 14 p Sponsored by NASA, USDA, Dept. of Commerce, Dept. of Interior, and Agency for International Development ERTS
(Proj. AgRISTARS)
(E82-10285; NASA-TM-84694; DC-Y1-04156; NSTL/ERL-198; NAS 1.15:84694) Avail: NTIS HC A02/MF A01 CSCL 02C

Measurements were made for 12 registrations done by ERL for 8 registrations done by SRS. The results indicate that the ERL method is significantly more accurate in five of the eight comparison. The difference between the two methods are not significant in the other three cases. There are two possible reasons for the differences. First, the ERL model is a piecewise linear model and the EDITOR model is a cubic polynomial model. Second, the ERL program resamples using bilinear interpolation while the EDITOR software uses a nearest neighbor resampling. This study did not indicate how much of the difference is attributable to each factor. The average of all merged scene error values for ERL was 31.6 meters and the average for the eight common areas was 32.6 meters. The average of the eight merged scene error values for SRS was 40.1 meters. T.M.

N82-24564*# National Aeronautics and Space Administration. National Space Technology Labs., Bay Saint Louis, Miss.

AN ALGORITHM FOR AUTOMATING THE REGISTRATION OF USDA SEGMENT GROUND DATA TO LANDSAT MSS DATA

M. H. Graham, Principal Investigator Dec. 1981 31 p refs Sponsored by NASA, USDA, Dept. of Commerce, Dept. of Interior and Agency for International Development ERTS
(Proj. AgRISTARS)
(E82-10286; NASA-TM-84695; DC-YI-04211; NSTL/ERL-201; NAS 1.15:84695) Avail: NTIS HC A03/MF A01 CSCL 02C

The algorithm is referred to as the Automatic Segment Matching Algorithm (ASMA). The ASMA uses control points or the annotation record of a P-format LANDSAT computer compatible tape as the initial registration to relate latitude and longitude to LANDSAT rows and columns. It searches a given area of LANDSAT data with a 2x2 sliding window and computes gradient values for bands 5 and 7 to match the segment boundaries. The gradient values are held in memory during the shifting (or matching) process. The reconstructed segment array, containing ones (1's) for boundaries and zeros elsewhere are computer compared to the LANDSAT array and the best match computed. Initial testing of the ASMA indicates that it has good potential for replacing the manual technique. T.M.

N82-24565*# National Aeronautics and Space Administration. National Space Technology Labs., Bay Saint Louis, Miss.

ANALYSIS OF THEMATIC MAPPER SIMULATOR DATA ACQUIRED DURING WINTER SEASON OVER PEARL RIVER, MISSISSIPPI, TEST SITE

J. E. Anderson and M. T. Kalcic, Principal Investigators Mar. 1982 45 p refs Sponsored by NASA, USDA, Dept. of Commerce Dept. of Interior and Agency for International Development Original contains color imagery. Original photography may be purchased from EROS Data Center, Sioux Falls, S.D. 57198 ERTS
(Proj. Agristars)
(E82-10287; NASA-TM-84696; RR-Y1-04217; NSTL/ERL-202; NAS 1.15:84696) Avail: NTIS HC A03/MF A01 CSCL 05B

Digital processed aircraft-acquired thematic mapping simulator (TMS) data collected during the winter season over a forested site in southern Mississippi are presented to investigate the utility of TMS data for use in forest inventories and monitoring. Analyses indicated that TMS data are capable of delineating the mixed forest land cover type to an accuracy of 92.5 % correct. The accuracies associated with river bottom forest and pine forest were 95.5 and 91.5 % correct. The accuracies associated with river bottom forest and pine forest were 95.5 and 91.5 % correct, respectively. The figures reflect the performance for products produced using the best subset of channels for each forest cover type. It was found that the choice of channels (subsets) has a significant effect on the accuracy of classification produced, and that the same channels are not the most desirable for all three forest types studied. Both supervised and unsupervised spectral signature development techniques are evaluated; the unsupervised methods proved unacceptable for the three forest types considered. E.A.K.

N82-24566*# Mississippi State Univ., Mississippi State. Remote Sensing Center.

APPLICATION OF REMOTE SENSING TO STATE AND REGIONAL PROBLEMS Semiannual Progress Report, 1 May - 31 Oct. 1981

W. Frank Miller, Jon R. Clark, Jimmy L. Solomon, Brian Duffy, Karen Minchew, and Linda H. Wright, Principal Investigator 1 Nov. 1981 89 p refs ERTS

(Grant NGL-25-001-054)
(E82-10288; NASA-CR-168857; NAS 1.26:168857; SAPR-16) Avail: NTIS HC A05/MF A01 CSCL 06B

The objectives, accomplishments, and future plans of several LANDSAT applications projects in Mississippi are discussed. The applications include land use planning in Lowandes County, strip mine inventory and reclamation, white tailed deer habitat evaluation, data analysis support systems, discrimination of forest habitats in potential lignite areas, changes in gravel operations, and determination of freshwater wetlands for inventory and monitoring. In addition, a conceptual design for a LANDSAT based information system is discussed. M.G.

N82-24567*# Utah Univ., Salt Lake City. Center for Remote Sensing and Cartography.

IDENTIFYING ENVIRONMENTAL FEATURES FOR LAND MANAGEMENT DECISIONS Annual Report

27 Oct. 1981 55 p refs Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S. D. 57198 ERTS
(Grant NAGw-95)
(E82-10289; NASA-CR-168858) Avail: NTIS HC A04/MF A01 CSCL 05B

Advances in digital processing of LANDSAT imagery and in the interpretation of aerial photography are reported as well as the development of a geographic information system and the acquisition of cartographic equipment. Services to technical specialists and dignitaries are also described. The status of the following studies is discussed: Farmington Bay waterfowl; Sevier River wetland and agriculture; Davis County foothill development; Bear River Range aspen habitat; Wasatch-Cache riparian habitats; irrigated acreage in the Bear River Basin; the Parker Mountain rangeland inventory; and the development of techniques for inventorying aspen and aspen conifer stands. The cooperative project with NASA-Ames to verify LANDSAT digital maps of the forest and range resources on the LaSal Mountains is also considered. A.R.H.

N82-24568*# National Conference of State Legislatures, Denver, Colo. Remote Sensing Project.

A LEGISLATOR'S GUIDE TO LANDSAT

[1982] 33 p Sponsored by NASA. Original contains color imagery. Original photography may be purchased from the EROS Data Center, Sioux Falls, S.D. 57198 ERTS
(E82-10290; NASA-CR-168859; NAS 1.26:168859) Avail: NTIS HC A03/MF A01 CSCL 05B

The LANDSAT satellite is an effective tool in meeting the natural resources data requirements of state and federal legislation. The availability of data from the satellite is beginning to have an impact on state legislature activities. An overview of the history, operation, and data analysis techniques, is presented as well as a discussion of the advantages and limitations of this method of remote sensing. Applications are discussed in the areas of (1) land resource planning and management; (2) coastal zone management; (3) agriculture; (4) forestry; (5) routing and siting; (6) environmental monitoring; and (7) geological exploration. National and state sources from which information about LANDSAT technology is available are listed. A.R.H.

N82-24569*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

DYNAMIC STUDY OF THE UPPER SAO FRANCISCO RIVER AND TRES MARIAS RESERVOIR USING MSS/LANDSAT IMAGES M.S. Thesis

Nelson deJesusParada, Principal Investigator and Tania Maria Sausen Oct. 1981 272 p refs In PORTUGUESE; ENGLISH summary ERTS
(E82-10291; NASA-CR-168860; NAS 1.26:168860; INPE-2249-TDL/066) Avail: NTIS HC A12/MF A01 CSCL 05B

The relationship between the dispersion and concentration of sediment in the superficial layers of the Tres Marias reservoir and the dynamics of the drainage basins of its tributaries was verified using LANDSAT MSS imagery. The drainage network, dissection patterns, and land use of each watershed were considered in an analysis of multispectral images, corresponding to bands 4,5, and 7, of dry and rainy seasons in 1973, 1975, 1977, and 1978. The superficial layer water layers of the reservoir were also divided according to the grey level pattern of each image. Two field trips were made to collect Secchi depths and in situ water reflectance. It is concluded that it is possible to determine the main factors that act in the dynamics of the drainage basins of a reservoir by simultaneous control of the physical variables and the antropic action of each basin. A.R.H.

N82-24570*# Survey of India, Dehra Dun. Geodetic and Research Branch.

REPORT OF MAGSAT PROJECT BY SURVEY OF INDIA Status Report

J. L. Sawhney 18 Aug. 1981 4 p refs Sponsored by NASA ERTs
(E82-10293; NASA-CR-168916; NAS 1.26:168916) Avail: NTIS HC A02/MF A01 CSCL 08G

MAGSAT data of quiet days for the period 4.11.79, 17.11.79 to 24.11.79, which pertains to 44 passes, was screened to exclude the the period of exclude the period of maximum diurnal variation. The results of this screening process is a data set that has the effect, (or at least the major part of the effect), of the external field removed from it. Such a data set is the basis for further analysis which is in hand. The data set is now being reduced to horizontal plane. The mathematical techniques uses a finite harmonic series representation of the three dimensional data, combined with least squares approach for the solution of coefficients. A computer programme was developed to reduce satellite data to a common elevation. A.R.H.

N82-24571*# Agricultural Research Service, Weslaco, Tex.

METHODS OF EDITING CLOUD AND ATMOSPHERIC LAYER AFFECTED PIXELS FROM SATELLITE DATA Quarterly Progress Report, 5 Dec. 1981 - 5 Mar. 1982

Paul R. Nixon, Craig L. Wiegand, Arthur J. Richardson, and Michael P. Johnson, Principal Investigators Mar. 1982 7 p refs HCMM
(NASA Order S-75406-B)
(E82-10295; NASA-CR-168864; NAS 1.26:168864; QPR-5) Avail: NTIS HC A02/MF A01 CSCL 05B

Subvisible cirrus clouds (SCi) were easily distinguished in mid-infrared (MIR) TIROS-N daytime data from south Texas and northeast Mexico. The MIR (3.55-3.93 micrometer) pixel digital count means of the SCi affected areas were more than 3.5 standard deviations on the cold side of the scene means. (These standard deviations were made free of the effects of unusual instrument error by factoring out the Ch 3 MIR noise on the basis of detailed examination of noisy and noise-free pixels). SCi affected areas in the IR Ch 4 (10.5-11.5 micrometer) appeared cooler than the general scene, but were not as prominent as in Ch 3, being less than 2 standard deviations from the scene mean. Ch 3 and 4 standard deviations and coefficients of variation are not reliable indicators, by themselves, of the presence of SCi because land features can have similar statistical properties. Author

N82-24572*# Indian Inst. of Geomagnetism, Bombay.

MAGSAT FOR GEOMAGNETIC STUDIES OVER INDIAN REGION Progress Report, 1 Nov. 1981 - 31 Mar. 1982

R. G. Rastogi, B. P. Singh, D. R. K. Rao, G. K. Rangarajan, R. Rajaram, M. Roy, and B. R. Arora, Principal Investigators 1 Apr. 1982 5 p ERTs
(E82-10296; NASA-CR-168865; NAS 1.26:168865; M-38; PR-2) Avail: NTIS HC A02/MF A01 CSCL 08G

The major activities of the period are summarized. Data tapes generated on an IBM system were read on DEC-10 system new tapes compatible with DEC-10 system were prepared for data sections of interest. Core and external current contributions were removed from selected passes over the Indian region and the residuals analyzed. Possible equatorial electrojet contributions to the MAGSAT data were studied. J.D.

N82-24573*# Business and Technological Systems, Inc., Seabrook, Md.

AN EQUIVALENT LAYER MAGNETIZATION MODEL FOR THE UNITED STATES DERIVED FROM MAGSAT DATA

M. A. Mayhew and S. C. Galliher, Principal Investigators [1982] 8 p refs ERTS
(Contract NAS5-26328)
(E82-10297; NASA-CR-168866; NAS 1.26:168866) Avail:

NTIS HC A02/MF A01 CSCL 05B

Long wavelength anomalies in the total magnetic field measured field measured by MAGSAT over the United States and adjacent areas are inverted to an equivalent la er crustal magnetization distribution. The model is based on an equal area dipole grid at the Earth's surface. Model resolution having physical significance, is about 220 km for MAGSAT data in the elevation range 300-500 km. The magnetization contours correlate well with large-scale tectonic provinces. Author

N82-24574*# Pennsylvania State Univ., University Park. Office for Remote Sensing of Earth Resources.

DELINEATION OF SOIL TEMPERATURE REGIMES FROM HCMM DATA Quarterly Report

Rick L. Day and Gary W. Petersen, Principal Investigators 31 Mar. 1982 3 p refs HCMM

(E82-10298; NASA-CR-168867; NAS 1.26:168867) Avail: NTIS HC A02/MF A01 CSCL 08M

The subsetting of HCMM data into ORSER format was completed for four dates using a modified SUBSET program. Large areas (approximately 2500 scan lines, 1680 elements) were selected to increase the occurrence of suitable control points for registration. Average daily temperatures (ADT) were calculated for each date. The MERGE program combined registered daytime temperature (DAY-IR) with nighttime temperature (NIGHT-IR) to form a separate two-channel data set. The SUBTRAN program averaged the DAY-IR and NIGHT-IR creating a third ADT channel. Registration equations for the four ADT data sets were generated. A one dimensional soil heat flow equation was modified to allow for mean annual soil temperature predictions using merged ADT data sets. A.R.H.

N82-24575*# Florida Univ., Gainesville.

USE OF THERMAL INERTIA DETERMINED BY HCMM TO PREDICT NOCTURNAL COLD PRONE AREAS IN FLORIDA Quarterly Report, 16 Sep. - 15 Dec. 1981

L. H. Allen, Jr., Principal Investigator, Ellen Chen, J. D. Martsolf, and P. H. Jones 15 Dec. 1981 15 p refs HCMM

(Contract NAS5-26453)

(E82-10299; NASA-CR-168868; NAS 1.26:168868) Avail: NTIS HC A02/MF A01 CSCL 04B

Surface temperatures derived from HCMM data were compared with to those obtained by GOES satellite and the apparent thermal inertia (ATI) calculated. For two dates, the HCMM temperatures appear to be about 5 C lower than the GOES temperatures. The ATI for excessively-drained to well-drained mineral soils was greater than for drained organic soils possibly because of long periods of low rainfall during late 1980 and early 1981. Organic soils cropped to sugar cane showed lower ATI after a severe killing freeze. With dead leaves, there was less transpiration and more solar radiation probably reached the dark soil surface. This would explain the larger diurnal temperature amplitude observed. A.R.H.

N82-24576*# Instituto Geografico Nacional, Madrid (Spain).

THERMAL MAPPING, GEOTHERMAL SOURCE LOCATION, NATURAL EFFLUENTS AND PLANT STRESS IN THE MEDITERRANEAN COAST OF SPAIN Final Report, Sep. 1978 - Aug. 1980

Rodolfo Nunez delasCuevas, Principal Investigator and Antonio Martinez deAragon 31 Mar. 1981 218 p Sponsored by NASA Original contains color imagery. Original imagery may be purchased from NASA Goddard Space Flight Center, (code 601), Greenbelt, Md. 20770. Domestic users send orders to 'Attn: National Space Science Data Center'; non-domestic users send orders to 'Attn: World Data Center A for Rockets and Satellites'. HCMM

(E82-10300; NASA-CR-168869; NAS 1.26:168869) Avail: NTIS HC A10/MF A01 CSCL 08G

Data obtained by HCMM satellite over a complex area in eastern Spain were evaluated and found to be most useful in studying macrostructures in geology and in analyzing marine currents, layers, and areas (although other satellites provide more data). The upper scale to work with HCMM data appears to be 1:2.000.000. Techniques used in preprocessing, processing, and analyzing imagery are discussed as well as methods for pattern recognition. Surface temperatures obtained for soils, farmlands, forests, geological structures, and coastal waters are discussed. Suggestions are included for improvements needed to achieve better results in geographic areas similar to the study area. E.A.K.

N82-24577*# Analytic Sciences Corp., Reading, Mass.

[ANALYZING THE BROKEN RIDGE AREA OF THE INDIAN OCEAN USING MAGNETIC AND GRAVITY ANOMALY MAPS AND GEOID UNDULATION AND BATHYMETRY DATA] Quarterly Progress Report, 1 Jan. - 31 Mar. 1982

Andrew R. Lazarewicz and Richard V. Sailor, Principal Investigators 15 Apr. 1982 19 p refs ERTS

(Contract NAS5-26424)

(E82-10303; NASA-CR-168878; NAS 1.26:168878) Avail: NTIS HC A02/MF A01 CSCL 08G

A higher resolution anomaly map of the Broken Ridge area (2 degree dipole spacing) was produced and reduced to the pole using quiet time data for this area. The map was compared with equally scaled maps of gravity anomaly, geoid undulation, and bathymetry. The ESMAP results were compared with a NASA MAGSAT map derived by averaging data in two-degree bins. A survey simulation was developed to model the accuracy of MAGSAT anomaly maps as a function of satellite altitude, instrument noise level, external noise model, and crustal anomaly field model. A preliminary analysis of the geophysical structure of Broken Ridge is presented and unresolved questions are listed. A.R.H.

N82-24578*# Analytic Sciences Corp., Reading, Mass.

[INVESTIGATING TECTONIC AND BATHYMETRIC FEATURES OF THE INDIAN OCEAN USING MAGSAT MAGNETIC ANOMALY DATA] Quarterly Progress Report, 1 Sep. - 31 Dec. 1981

Andrew R. Lazarewicz and Richard V. Sailor, Principal Investigators 22 Jan. 1982 17 p refs ERTS

(Contract NAS5-26424)

(E82-10304; NASA-CR-168879; NAS 1.26:168879; PR-1325-4) Avail: NTIS HC A02/MF A01 CSCL 08G

MAGSAT Investigator-B tapes were preprocessed by (1) removing all data points with obvious erroneous values and location errors; (2) removing smaller spikes (typically 15 nT or more), and deleting data tracks with fewer than 20 points; and (3) removing a linear trend from each track. The remaining data were recorded on tape for use by the equivalent source mapping (ESMAP) program which uses a least squares algorithm to fit the magnetization parameter of the grid of equivalent source dipoles in the crust to satellite data acquired at different times and locations. ESMAP was implemented on the TASC computing system and modified to read preprocessed MAGSAT tapes and interface with TASC plotting software. Some verification of the software was accomplished. Gridded 1-degree mean values of gravity anomaly and sea surface undulation computed from SEASAT radar altimeter were obtained and brought on line. A.R.H.

N82-24579*# Massachusetts Univ., Amherst. Dept. of Geology.

THE MINERALOGY OF GLOBAL MAGNETIC ANOMALIES Progress Report, Sep. 1981 - Jan. 1982

Stephen E. Haggerty, Principal Investigator 15 Feb. 1982 31 p refs ERTS

(Contract NAS5-26414)

(E82-10305; NASA-CR-168880; NAS 1.26:168880) Avail: NTIS HC A03/MF A01 CSCL 08G

Problems with the Curie balance, which severely hindered the acquisition of data, were rectified. Chemical analytical activities are proceeding satisfactorily. The magnetization characteristics of metamorphic suites were analyzed and susceptibility data for a wide range of metamorphic and igneous rocks. These rock magnetic signatures are discussed as well as the relationships between geology, gravity and MAGSAT anomalies of West Africa. A.R.H.

N82-24580*# Texas Univ. at Dallas, Richardson. Center for Space Sciences.

INVESTIGATION OF THE EFFECTS OF EXTERNAL CURRENT SYSTEMS ON THE MAGSAT DATA UTILIZING GRID CELL MODELING TECHNIQUES Quarterly Status Technical Progress Report, 1 Jan. - 31 Mar. 1982

David M. Klumpar, Principal Investigator 27 Apr. 1982 11 p ERTS
(Contract NAS5-26309)
(E82-10306; NASA-CR-168881; NAS 1.26:168881; STPR-6) Avail: NTIS HC A02/MF A01 CSCL 05B

Progress made in reducing MAGSAT data and displaying magnetic field perturbations caused primarily by external currents is reported. A periodic and repeatable perturbation pattern is described that arises from external current effects but appears as unique signatures associated with upper middle latitudes on the Earth's surface. Initial testing of the modeling procedure that was developed to compute the magnetic fields at satellite orbit due to current distributions in the ionosphere and magnetosphere is also discussed. The modeling technique utilizes a linear current element representation of the large scale space current system. M.G.

N82-24581*# North Carolina State Univ., Raleigh. Dept. of Marine, Earth and Atmospheric Sciences.
[MAGSAT SCALAR AND VECTOR ANOMALY DATA ANALYSIS] Progress Report, period ending 31 Jan. 1982
1 Feb. 1982 1 p ERTS
(Contract NAS5-26157)
(E82-10307; NASA-CR-168882; NAS 1.26:168882) Avail: NTIS HC A02/MF A01 CSCL 08B

Efforts on the analysis of MAGSAT scalar anomaly data, the application of the scalar analysis results to three component vector data, and the comparison of MAGSAT data with corresponding MAGNET aeromagnetic and free air gravity anomaly data are briefly described. M.G.

N82-24582*# Wisconsin Univ., Madison.
INVESTIGATION OF ANTARCTIC CRUST AND UPPER MANTLE USING MAGSAT AND OTHER GEOPHYSICAL DATA Quarterly Status Technical Progress Report
C. R. Bentley, Principal Investigator 14 Jan. 1982 1 p ERTS
(Contract NAS5-25977)
(E82-10308; NASA-CR-168883; NAS 1.26:168883; QSTPR-8) Avail: NTIS HC A02/MF A01 CSCL 08G

Development of a spectral analysis technique to determine the depth to the Curie Isotherm from MAGSAT data over Antarctica is reported. The analysis of the power spectra of a number of MAGSAT passes over Antarctica indicates on the average two power maxima for each flight pass, one with spatial wavelength of approximately 2000 km and the other with a wavelength of approximately 700 km. It was not determined whether these spectral peaks are geological or mathematical in origin. T.M.

N82-24583*# Wisconsin Univ., Madison.
INVESTIGATION OF ANTARCTIC CRUST AND UPPER MANTLE USING MAGSAT AND OTHER GEOPHYSICAL DATA Quarterly Status Technical Progress Report
C. R. Bentley, Principal Investigator 16 Apr. 1982 1 p ERTS
(Contract NAS5-25977)
(E82-10309; NASA-CR-168884; NAS 1.26:168884; QSTPR-9) Avail: NTIS HC A02/MF A01 CSCL 08G

Plans to create an improved version of the MAGSAT magnetic anomaly map by more carefully scrutinizing the accepted data for field-aligned current effects are discussed. Data are continued to a 300 km surface for the compilation of a final map. Based on this set of data, vector anomaly maps over Antarctica are planned. A high-pass anomaly map with a cut-off wavelength of approximately 1500 km is also envisioned. It is suspected that longer-wavelength features have their origin outside the crust. T.M.

N82-24584*# Colorado Univ., Boulder. Dept. of Astro-Geophysics.
INVESTIGATION OF GEOMAGNETIC FIELD FORECASTING AND FLUID DYNAMICS OF THE CORE Quarterly Progress Report, 1 Jan. - 31 Mar. 1982
Edward R. Benton, Principal Investigator 1 Apr. 1982 7 p refs ERTS
(Contract NAS5-25957)
(E82-10310; NASA-CR-168885; NAS 1.26:168885; QPR-9) Avail: NTIS HC A02/MF A01 CSCL 08G

It was established that the total absolute magnetic flux crossing the core- mantle boundary has been a constant of the core motion for the last 50 years. This provides a scalar constraint that could be added to the geometric modelling procedure. The GSFC 8 8/80 model is being evaluated. The absolute magnetic flux linking the CMB to that model was plotted as a function of time during the span covered by the data, and increasing truncation level. The inclusion of the standard error of each Gauss coefficient derived from the statistics of fit in the GSFC 9/80 model is useful. The magnitude and sense (upwelling or downe welling) of vertical fluid motion adjacent to the core-mantle boundary was calculated using the model. Standard errors were found to be sufficiently small at all but one or two of the 40 or more critical points of B sub r. They do not nearly overlap the value gamma u/gamma r = 0. It is concluded that the core is upwelling and downwelling at an observationally detectable level. A.R.H.

N82-24585*# Pennsylvania State Univ., University Park. Dept. of Meteorology.
A METHOD FOR INFERRING AVAILABLE SURFACE MOISTURE USING REMOTE SURFACE TEMPERATURE MEASUREMENTS: AN ASSESSMENT
Toby N. Carlson, Principal Investigator Feb. 1982 33 p refs Sponsored by NASA ERTS
(E82-10311; NASA-CR-168886; NAS 1.26:168886) Avail: NTIS HC A03/MF A01 CSCL 08M

A method for inferring surface moisture availability, which combines a numerical boundary layer model with remote estimates of surface-temperature, is evaluated with regard to its ability to provide significant results. Some analyses of surface moisture availability based on GOES and on HCMM surface temperature measurements are presented for an urban area (St. Louis) and for a drought situation over Kansas. Patterns of moisture availability clearly indicate a relationship between land use, particularly vegetation cover, and derived moisture availability over urban areas and also suggest a relationship between antecedent rainfall and derived moisture availability over vegetated regions. Author

N82-24586*# Purdue Univ., Lafayette, Ind. Dept. of Geosciences.
[MAGNETIC AND GRAVITY ANOMALIES IN THE AMERICAS] Quarterly Progress Report, Oct. - Dec. 1981
L. W. Braile, W. J. Hinze, and R. R. B. vonFrese, Principal Investigators 30 Dec. 1981 7 p Sponsored by NASA ERTS
(E82-10312; NASA-CR-168888; NAS 1.26:168888) Avail: NTIS HC A02/MF A01 CSCL 05B

The cleaning and magnetic tape storage of spherical Earth processing programs are reported. These programs include: NVERTSM which inverts total or vector magnetic anomaly data on a distribution of point dipoles in spherical coordinates; SMFLD which utilizes output from NVERTSM to compute total or vector magnetic anomaly fields for a distribution of point dipoles in spherical coordinates; NVERTG; and GFLD. Abstracts are presented for papers dealing with the mapping and modeling of magnetic and gravity anomalies, and with the verification of crustal components in satellite data. T.M.

N82-24587*# Phoenix Corp., McLean, Va.
IMPROVED DEFINITION OF CRUSTAL MAGNETIC ANOMALIES FOR MAGSAT DATA Final Report
R. D. Brown, J. F. Frawley, W. M. Davis, R. D. Ray, E. Didwall, and R. D. Regan, Principal Investigators 15 Mar. 1982 23 p refs ERTS
(Contract NAS5-25882)
(E82-10314; NASA-CR-168889; NAS 1.26:168889) Avail: NTIS HC A02/MF A01 CSCL 08G

The routine correction of MAGSAT vector magnetometer data for external field effects such as the ring current and the daily variation by filtering long wavelength harmonics from the data is described. Separation of fields due to low altitude sources from those caused by high altitude sources is affected by means of dual harmonic expansions in the solution of Dirichlet's problem. This regression/harmonic filter procedure is applied on an orbit by orbit basis, and initial tests on MAGSAT data from orbit 1176 show reduction in external field residuals by 24.33 nT RMS in the horizontal component, and 10.95 nT RMS in the radial component. J.D.

N82-24588*# Zentralstelle fuer Geo-Photogrammetrie und Fernerkundung, Munich (West Germany).
MULTIDISCIPLINARY INVESTIGATIONS ON HCMM DATA OVER MIDDLE EUROPE AND MAROCCO Final Report, 1979 - 1981
Rupert Haydn, Principal Investigator, George Dalke, Jochen Henkel, and Hermann Kaufmann 10 Mar. 1982 86 p Sponsored by NASA, Deutsche Forschungsgemeinschaft and Bundesministerium fuer Forschung und Technologie Original contains color imagery. Original imagery may be purchased from NASA Goddard Space Flight Center, (code 601), Greenbelt, Md. 20770. Domestic users send orders to 'Attn: National Space Science Data Center'; nondomestic users send orders to 'Attn: World Data Center A for Rockets and Satellites'. HCMM
(E82-10315; NASA-CR-168910; NAS 1.26:168910) Avail: NTIS HC A05/MF A01 CSCL 05B

The development approaches in presenting HCMM data in combination with LANDSAT for improved interpretability is presented. The techniques are based on the IHS (intensity hue and saturation) concept which permits the calculation of LANDSAT/HCMM merges exhibiting the high spatial resolution of LANDSAT along with the HCMM thermal recordings coded into perceivable and interpretable colors. A further approach is based on the calculation of synthetic LANDSAT stereo images showing HCMM thermal recording as a quasitopography. The feasibility of these approaches are discussed on the tests The feasibility of these approaches are discussed on the basis of HCMM and LANDSAT images representing the test sites. On the basis of a scene covering an area of the Anti Atlas, the relationship between geological phenomena and their interpretability via LANDSAT/HCMM merged products. E.A.K.

N82-24589*# Technicolor Graphic Services, Inc., Sioux Falls, S. Dak.
AN INVESTIGATION OF MAGSAT AND COMPLEMENTARY DATA EMPHASIZING PRECAMBRIAN SHIELDS AND ADJACENT AREAS OF WEST AFRICA AND SOUTH AMERICA Quarterly Report, period ending 30 Sep. 1981
David A. Hastings, Principal Investigator 30 Sep. 1981 34 p Sponsored by NASA ERTS
(Contract DI-14-08-0001-16439)
(E82-10316; NASA-CR-168897; NAS 1.26:168897) Avail: NTIS HC A03/MF A01 CSCL 08B

Accomplishments with regard to the mapping and analysis of MAGSAT data for the investigation of correlations between the magnetic field characteristics of South American and African shields are reported. Significant results in the interpretation of the global total-field anomalies and the anomaly patterns of Africa and South America are discussed. The central position of the Brazilian shield tends to form a negative total-field anomaly, consistent with findings for shields in equatorial Africa. Sedimentary sequences in the Amazon basin and in the Rio de Janeiro-Sao Paolo areas exhibit positive anomalies, also consistent with equatorial Africa. Results for the Caribbean Sea and Guyana regions are also described. M.G.

N82-24590*# Technicolor Graphic Services, Inc., Sioux Falls, S. Dak.
AN INVESTIGATION OF MAGSAT AND COMPLEMENTARY DATA EMPHASIZING PRECAMBRIAN SHIELDS AND ADJACENT AREAS OF WEST AFRICA AND SOUTH AMERICA Quarterly Report, 1 Oct. - 31 Dec. 1981
David A. Hastings, Principal Investigator 31 Dec. 1981 13 p Sponsored by NASA ERTS
(Contract DE-14-08-0001-16439)
(E82-10317; NASA-CR-168895; NAS 1.26:168895) Avail: NTIS HC A02/MF A01 CSCL 08G

Several possible causes for the east-west striping of the MAGSAT anomaly maps are listed and discussed including: (1) the inadequacy of the field model used for core-crustal separation of geomagnetic anomalies; (2) external field noise remaining in the available maps; (3) east-west trends of crustal uplift and depression; (4) east-west trends to convection patterns in the mantle; (5) bands of crustal materials of similar metamorphic grade; (6) variations in the depth of the Curie isotherm; and (7) the data processing techniques used to overcome the absence of tie lines and orbital path of MAGSAT. M.G.

N82-24591*# Technicolor Graphic Services, Inc., Sioux Falls, S. Dak.
AN INVESTIGATION OF MAGSAT AND COMPLEMENTARY DATA EMPHASIZING PRECAMBRIAN SHIELDS AND ADJACENT AREAS OF WEST AFRICA AND SOUTH AMERICA Quarterly Report, 1 Jan. - 31 Mar. 1982
David A. Hastings, Principal Investigator 31 Mar. 1982 14 p Sponsored by NASA ERTS
(Contract DI-14-08-0001-21249)
(E82-10318; NASA-CR-168896; NAS 1.26:168896) Avail: NTIS HC A02/MF A01 CSCL 08B

The problems associated with the use of an interactive magnetic modeling program are reported and a publication summarizing the MAGSAT anomaly results for Africa and the possible tectonic associations of these anomalies is provided. An overview of the MAGSAT scalar anomaly map for Africa suggested a correlation of MAGSAT anomalies with major crustal blocks of uplift or depression and different degrees of regional metamorphism. The strongest MAGSAT anomalies in Africa are closely correlated spatially with major tectonic features. Results indicate that the Bangui anomaly may be caused by a central old Precambrian shield, flanked to the north and south by two relatively young sedimentary basins. M.G.

N82-24592*# Texas Univ. at El Paso. Dept. of Geological Sciences.
[THE CRUSTAL STRUCTURE AND TECTONICS OF SOUTH AMERICA] Quarterly Report, 1 Jul. - 30 Sep. 1981
G. R. Keller and E. G. Lidiak, Principal Investigators 30 Sep. 1981 4 p refs ERTS
(Contract NAS5-26326)
(E82-10319; NASA-CR-168898; NAS 1.26:168898) Avail: NTIS HC A02/MF A01 CSCL 08G

A preliminary crustal structure map and a bibliography of crustal and upper mantle studies for South America are given. Work on the surface wave analysis and tectonic characterizations continues. M.G.

N82-24593*# Texas Univ. at El Paso. Dept. of Geological Sciences.
[GEOTECTONICS OF SOUTH AMERICA] Quarterly Report, 1 Oct. 1981 - 31 Mar. 1982
G. R. Keller and E. G. Lidiak, Principal Investigators 31 Mar. 1982 36 p refs ERTS
(Contract NAS5-26326)
(E82-10320; NASA-CR-168899; NAS 1.26:168899) HC A03/MF A01 CSCL 08G

Preliminary satellite scalar magnetic anomaly data (MAGSAT) reduced to vertical polarization and long wavelength-pass filtered free air gravity anomaly data of South and Central America are compared to major tectonic features. In addition, a geotectonic overview of South America is presented. M.G.

N82-24594*# Iowa Univ., Iowa City. Dept. of Geology.
USE OF MAGSAT ANOMALY DATA FOR CRUSTAL STRUCTURE AND MINERAL RESOURCES IN THE US MIDCONTINENT Quarterly Report, period ending 31 Mar. 1982
Robert S. Carmichael, Principal Investigator et al 24 Mar. 1982 2 p ERTS
(Contract NAS5-26425)
(E82-10321; NASA-CR-168900; NAS 1.26:168900; QR-5) Avail: NTIS HC A02/MF A01 CSCL 08G

Personnel matters related to the processing and interpretation of MAGSAT data are reported. Efforts are being initiated to determine the crustal geology, structure, and potential economic consequences to be deduced from the satellite magnetic anomalies in conjuction with correlative data. A.R.H.

N82-24595*# Tokyo Univ. (Japan). Geophysics Research Lab.
REPORT OF INVESTIGATION FROM JAPANESE MAGSAT TEAM Progress Report, 1 Dec. 1981 - 30 Mar. 1982
Naoshi Fukushima, H. Maeda, T. Yukutake, M. Tanaka, S. Oshima, K. Ogawa, M. Kawamura, Y. Miyazaki, S. Uyeda, K. Kobayashi, Principal Investigators et al 5 Apr. 1982 13 p refs Submitted for publication ERTS
(E82-10322; NASA-CR-168901; NAS 1.26:168901; PR-5)

Avail: NTIS HC A02/MF A01 CSCL 08G

Progress in the data processing and data acquisition of computer compatible MAGSAT tapes is reported. Investigation focused on the crustal structure near Japan and its Antarctic station, and electric currents and hydrodynamic waves in the ionosphere and the magnetosphere. The magnetization of the crust in the northwestern Pacific region is discussed. T.M.

N82-24596*# Iowa Univ., Iowa City. Dept. of Geology.

USE OF MAGSAT ANOMALY DATA FOR CRUSTAL STRUCTURE AND MINERAL RESOURCES IN THE US MIDCONTINENT Quarterly Report, period ending 31 Dec. 1981

Robert S. Carmichael, Principal Investigator 31 Dec. 1981 31 p refs ERTS

(Contract NAS5-26425)

(E82-10323; NASA-CR-168902; NAS 1.26:168902; QR-4) Avail: NTIS HC A03/MF A01 CSCL 08G

The analysis and preliminary interpretation of investigator-B MAGSAT data are addressed. The data processing included: (1) removal of spurious data points; (2) statistical smoothing along individual data tracks, to reduce the effect of geomagnetic transient disturbances; (3) comparison of data profiles spatially coincident in track location but acquired at different times; (4) reduction of data by weighted averaging to a grid with 1 deg xl deg latitude/longitude spacing, and with elevations interpolated and weighted to a common datum of 400 km; (5) wavelength filtering; and (6) reduction of the anomaly map to the magnetic pole. Agreement was found between a magnitude data anomaly map and a reduce-to-the-pole map supporting the general assumption that, on a large scale (long wavelength), it is induced crustal magnetization which is responsible for major anamalies. Anomalous features are identified and explanations are suggested with regard to crustal structure, petrologic characteristics, and Curie temperature isotherms. M.G.

N82-24597*# Defence Science and Technology Organisation, Edgecliff (Australia).

HIGH RESOLUTION SATELLITE OBSERVATIONS OF MESOSCALE OCEANOGRAPHY IN THE TASMAN SEA, 1978 - 1979 Final Report, period ending 31 Mar. 1981

C. S. Nilsson, J. C. Andrews (Australian Inst. of Marine Science, Townsville), M. Hornibrook (CSIRO, North Ryde), A. R. Latham, G. C. Speechley, and P. Scully-Power, Principal Investigators Feb. 1982 88 p refs Sponsored by NASA Original contains imagery. Original imagery may be purchased from NASA Goddard Space Flight Center, (code 601), Greenbelt, Md. 20770. Domestic users send orders to 'Attn: National Space Data Center'; non-domestic users send orders to 'Attn: World Data Center A for Rockets and Satellites'. HCMM

(E82-10324; NASA-CR-168903; NAS 1.26:168903; RANRL-1/82; AR-002-695) Avail: NTIS HC A05/MF A01 CSCL 08J

Of the Nearly 1000 standard infrared photographic images received, 273 images were on computer compatible tape. It proved necessary to digitally enhance the scene contrast to cover only a select few degrees K over the photographic grey scale appropriate to the scene-specific range of sea surface temperature (SST). Some 178 images were so enhanced. Comparison with sea truth show that SST, as seen by satellite, provides a good guide to the ocean currents and eddies off East Australia, both in summer and winter. This is in contrast, particularly in summer, to SST mapped by surface survey, which usually lacks the necessary spatial resolution. Author

N82-24598*# Instituto de Pesquisas Espaciais, Sao Jose dos Campos (Brazil).

COMPARISON OF STORM-TIME CHANGES OF GEOMAGNETIC FIELD AT GROUND AND AT MAGSAT ALTITUDES, PART 2

Nelson deJesusParada, Principal Investigator, Rajaram Purushottam Kane, and Nalin Babulal Trivedi Apr. 1982 42 p Sponsored by NASA ERTS

(E82-10325; NASA-CR-168904; NAS 1.26:168904; INPE-2367-RA/161-Pt-2) Avail: NTIS HC A03/MF A01 CSCL 08N

Geomagnetic field variations were studied by considering the parameter delta H which indicated H(observed) minus H(model), where H = (X squared + Y squared) (1/2) where X, Y, and Z are the components actually observed. Quiet time base values for 5 deg longitude belts were estimated. After subtracting these from the observed values, the residual delta H (dawn) and delta H (dusk) were studied for the two major storms. It was noticed that the dusk values attained larger (negative) values for a longer time, than the dawn value. Some changes in delta Y and delta Z were also noticed, indicating possibilities of either meridional currents and/or noncoincidence of the central plane of the ring current with the equatorial plane of the Earth. Other details are described. M.G.

N82-24599*# Paris VI Univ. (France).

MAGSAT ANOMALY MAP AND CONTINENTAL DRIFT Progress Report

Jean-Louis LeMouel, Principal Investigator, Armand Galdeano, and Joel Ducruix 1 Dec. 1981 5 p refs Sponsored by NASA ERTS

(E82-10326; NASA-CR-168905; NAS 1.26:168905) Avail: NTIS HC A02/MF A01 CSCL 08G

Anomaly maps of high quality are needed to display unambiguously the so called long wave length anomalies. The anomalies were analyzed in terms of continental drift and the nature of their sources is discussed. The map presented confirms the thinness of the oceanic magnetized layer. Continental magnetic anomalies are characterized by elongated structures generally of east-west trend. Paleomagnetic reconstruction shows that the anomalies found in India, Australia, and Antarctic exhibit a fair consistency with the African anomalies. It is also shown that anomalies are locked under the continents and have a fixed geometry. T.M.

N82-24600*# Paris VI Univ. (France).

MODELS AND MAPS OF THE MAIN FIELD Progress Report

Jean-Louis LeMouel, Principal Investigator, Camille Gire, and Joel Ducruix 1 Apr. 1982 13 p refs Sponsored by NASA ERTS (E82-10327; NASA-CR-168906; NAS 1.26:168906) Avail: NTIS HC A02/MF A01 CSCL 08B

The difference between the models comes from the difference in the procedures of data selection and depends on the aim the model is intended for: regional studies necessitates locally higher density of data and for downward continuation the reduction of external variations must be as careful as possible. Refinements of preliminary models MAGP1 and MAGP2 are presented. Models MAGP1 and MAGP2 are found to have drawbacks coming from insufficient reduction of the external variations and from the inhomogeneity in the distribution of the measurement points. New analysis was performed to overcome these shortcomings. The quality of the new models is characterized by the average rms of the differences measurement model. T.M.

N82-24601*# Brigham Young Univ., Provo, Utah. Dept. of Civil Engineering.

HCMM HYDROLOGICAL ANALYSIS IN UTAH Quarterly Progress Report

28 Feb. 1982 43 p Sponsored by NASA HCMM

(E82-10328; NASA-CR-168907; NAS 1.26:168907; QPR-3) Avail: NTIS HC A03/MF A01 CSCL 05B

Temperature calibration and groundwater depth location studies were finalized. Distinctions among algae species and among suspended materials (turbidity) using HCMM data were investigated. Field evaluations of algae's effect on evaporation pan readings were completed and related to the lake and HCMM data. Additional correlations among infrared and reflectivity data were made using the color graphics capabilities developed during this project. E.A.K.

N82-24602*# South Dakota State Univ., Brookings. Remote Sensing Inst.

EVALUATION OF HCMM DATA FOR ASSESSING SOIL MOISTURE AND WATER TABLE DEPTH Final Report, Jun. 1977 - Mar. 1981

D. G. Moore, J. L. Heilman, J. A. Tunheim, F. C. Westin, W. E. Heilman, G. A. Beutler, and S. D. Ness, Principal Investigators Aug. 1981 205 p refs Original contains imagery. Original imagery may be purchased from NASA Goddard Space Flight Center, (code 601), Greenbelt, Md. 20770 Domestic users

send orders to 'Attn: National Space Science Data Center'; nondomestic users send orders to 'Attn: World Data Center A for Rockets and Satellites'. HCMM
(Contract NAS5-24206)
(E82-10329; NASA-CR-168944; NAS 1.26:168944; SDSU-RS1-81-04) Avail: NTIS HC A10/MF A01 CSCL 08M

Soil moisture in the 0-cm to 4-cm layer could be estimated with 1-mm soil temperatures throughout the growing season of a rainfed barley crop in eastern South Dakota. Empirical equations were developed to reduce the effect of canopy cover when radiometrically estimating the soil temperature. Corrective equations were applied to an aircraft simulation of HCMM data for a diversity of crop types and land cover conditions to estimate the soil moisture. The average difference between observed and measured soil moisture was 1.6% of field capacity. Shallow alluvial aquifers were located with HCMM predawn data. After correcting the data for vegetation differences, equations were developed for predicting water table depths within the aquifer. A finite difference code simulating soil moisture and soil temperature shows that soils with different moisture profiles differed in soil temperatures in a well defined functional manner. A significant surface thermal anomaly was found to be associated with shallow water tables. A.R.H.

N82-24603*# Miami Univ., Fla. School of Marine and Atmospheric Science.
INVESTIGATIONS OF MEDIUM WAVELENGTH MAGNETIC ANOMALIES IN THE EASTERN PACIFIC USING MAGSAT DATA Interim Report, Oct. - Dec. 1981
Christopher G. A. Harrison, Principal Investigator Feb. 1982 3 p ERTS
(E82-10330; NASA-CR-168909; NAS 1.26:168909) Avail: NTIS HC A02/MF A01 CSCL 08G

Efforts concerning spherical harmonic modeling of the Earth's magnetic field and the use of such models in removing core produced magnetic fields from magnetic fields of crustal origin are discussed. Results indicate that the terms of a spherical harmonic expansion do not uniquely determine a given wavelength of signal as the terms in a Fourier series do. Addition of terms of higher degree and order to a spherical harmonic expansion tend to fine tune the amplitude of the terms of lower degree and order. As a result, removal of such a model from a regional data set will not remove long wavelengths completely. M.G.

N82-24604*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
SEASAT VIEWS OCEANS AND SEA ICE WITH SYNTHETIC APERTURE RADAR
Lee-Lueng Fu and Benjamin Holt 15 Feb. 1982 209 p refs
(NASA-CR-168919; JPL-Pub-81-120; NAS 1.26:168919) Avail: NTIS HC A10/MF A01 CSCL 08J

Fifty-one SEASAT synthetic aperture radar (SAR) images of the oceans and sea ice are presented. Surface and internal waves, the Gulf Stream system and its rings and eddies, the eastern North Pacific, coastal phenomena, bathymetric features, atmospheric phenomena, and ship wakes are represented. Images of arctic pack and shore-fast ice are presented. The characteristics of the SEASAT SAR system and its image are described. Maps showing the area covered, and tables of key orbital information, and listing digitally processed images are provided. Author

N82-24605*# National Aeronautics and Space Administration. Wallops Flight Center, Wallops Island, Va.
NOSS ALTIMETER DETAILED ALGORITHM SPECIFICATIONS
David W. Hancock, III and James D. McMillan (EG and G Washington Analytical Services Center, Inc., Pocomoke City, Md.) Mar. 1982 199 p refs
(NASA-TM-73293; NAS 1.15:73293) Avail: NTIS HC A09/MF A01 CSCL 17I

The details of the algorithms and data sets required for satellite radar altimeter data processing are documented in a form suitable for (1) development of the benchmark software and (2) coding the operational software. The algorithms reported in detail are those established for altimeter processing. The algorithms which required some additional development before documenting for production were only scoped. The algorithms are divided into two levels of processing. The first level converts the data to engineering units and applies corrections for instrument variations. The second level provides geophysical measurements derived from altimeter parameters for oceanographic users. Author

N82-24606# Geological Survey, Arlington, Va.
US GEOLOGICAL SURVEY WORKSHOP ON NONFUEL MINERAL RESOURCE APPRAISAL OF WILDERNESS AND CUSMAP AREAS
Daniel R. Shawe, comp. 1981 21 p Proceedings of Workshop held in Denver, 10-12 Dec. 1979
(CIRC-845) Avail: NTIS HC A02/MF A01

The steps needed to appraise mineral resources in one GUSMAP quadrangle and one wilderness area in each of the three major geologic provinces of the United States are discussed. The topographic quadrangles selected are: Tonopah, Nevada, in the basin range province; Poplar Bluff, Missouri-Arkansas, in the midcontinent region; and Hibbing, Minnesota, in the upper Midwest. The steps used in appraisals of these areas include; compilation of data, ore deposit modeling, first stage analysis, field studies needed to acquire data; and presentation of resource appraisals and supporting data. T.M.

N82-24607# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
REPORTS ON CARTOGRAPHY AND GEODESY. SERIES 2: TRANSLATIONS, NUMBER 39
1981 68 p refs
(ISSN-0469-4244) Avail: NTIS HC A04/MF A01

Satellite applications relative to mapping and Doppler navigation are treated. Spaceborne Earth observation technology is reviewed and the impact of satellite photogrammetry on cartography is assessed. Point positioning experiments, using navigation satellites, are also evaluated. For individual titles, see N82-24608 through N82-24609.

N82-24608# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
THE EUROPEAN SPACE REMOTE SENSING PROGRAM
Gottfried Konecny *In its* Inform. Relative to Cartography and Geodesy. Ser. 2: Transl., No. 39 1981 p 5-39 refs (For primary document see N82-24607 15-43)
Avail: NTIS HC A04/MF A01

The possibilities of spaceborne Earth sensing are analyzed with particular reference to European programs. Photogrammetric capabilities of different satellites are emphasized. Systems that produce imagery for geometric and radiometric measurements as well as for interpretation of objects are identified. These are (1) weather satellites; (2) automatic Earth observation satellites; (3) reconnaissance satellites; and (4) manned orbital missions. Remote sensing program accomplishments and planning in the U.S. and in other countries are reviewed and compared, including financial aspects. The various sensors and Earth observation methods are described in terms of performance and efficiency. Results show that satellite photogrammetry can be used for the production of topographic maps. Satellite imagery is also suitable for the purposes of resources management. Author (ESA)

N82-24609# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
DOPPLER ACTIVITIES AND EXPERIENCE IN POINT POSITIONING AT THE INSTITUTE FOR APPLIED GEODESY, ACTING WITHIN THE SATELLITE GEODESY SPECIAL RESEARCH PROGRAM (SFB 78)
Wolfgang Schlueter *In its* Inform. Relative to Cartography and Geodesy. Ser. 2: Transl., No. 39 1981 p 41-61 refs (For primary document see N82-24607 15-43)
Avail: NTIS HC A04/MF A01

The Navy Navigation Satellite system (NNSS) was used for point positioning experiments. The computations were carried out with broadcast and precise ephemeris, using single point positioning techniques and modified methods. The accuracy of point positioning using NNSS, is estimated. The reproducibility of the NNSS coordinates in single point mode is, using the broadcast ephemeris, on the order of 5 m and, using the precise ephemeris, on the order of 1 m. The accuracy, using the multipoint

positioning method independent from the ephemeris, is about 0.2 m to 0.4 m which is confirmed by a comparison of Doppler results with coordinates of a classical terrestrial network of an area 1000 km by 1000 km. Author (ESA)

N82-24610# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
REPORTS ON CARTOGRAPHY AND GEODESY. SERIES 1: ORIGINAL REPORTS, NUMBER 82 [NACHRICHTEN AUS DEM KARTEN- UND VERMESSUNGSWESEN. REIHE 1: ORIGINALBEITRAEGE, HEFT NR. 82]
1981 118 p refs In GERMAN; ENGLISH summary (ISSN-0469-4236) Avail: NTIS HC A06/MF A01

Technological advances related to cartography reported include the use of EDP for mapping and image processing; problems in image enhancement and raster display; Earth observation from space and the impact of satellite photogrammetry on cartography. A new photographic film is also discussed. For individual titles, see N82-24611 through N82-24616.

N82-24611# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
A SYSTEM OF PROGRAMS FOR TOPOLOGICAL SELECTION IN LINE NETWORKS AND HIERARCHIAL POLYGON NETWORKS [EIN PROGRAMMSYSTEM ZUR TOPOLOGISCHEN SELEKTION IN LINIENNETZEN UND HIERARCHISCH GEGLIEDERTEN FLAECHENNETZEN]
Lorenz Denn and Wigand Weber *In its* Repts. on Cartography and Geodesy. Ser. 1: Original Repts., No. 82 1981 p 5-25 refs In GERMAN; ENGLISH summary (For primary document see N82-24610 15-43)
Avail: NTIS HC A06/MF A01

For a cartographic data base, a program system was established, allowing the selection of objects of polygon networks or line networks according to topologic criteria. It is possible to select the boundaries or polygons meeting in a node of such a network or the boundaries surrounding an area or its adjoining area. The solution as realized is characterized by the fact that topologic relations in the data base are not given by pointers, but are calculated by planimetric coordinates and that the areas in the polygon network may be nested hierarchically, e.g., showing political regions. Author (ESA)

N82-24612# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
PROBLEMS IN OBLIQUE SHADING [EINIGE PROBLEME DER SCHRAEGLICHTSCHATTIERUNG]
Hans-Joerg Gottschalk *In its* Repts. on Cartography and Geodesy. Ser. 1: Original Repts., No. 82 1981 p 27-34 refs In GERMAN; ENGLISH summary (For primary document see N82-24610 15-43)
Avail: NTIS HC A06/MF A01

An EDP approach to relief shading of digitally generated maps is presented. In analytical shading, there are problems which make the result of enhancement algorithms, although correct in principle, appear unsatisfactory. First, as the shadow is correlated with the surface normal of the digital terrain model used, there are effects on the analytical hill shaded image which result when the height accuracy of the height model suffices but the form accuracy does not. Height profiles and contours from which the model is derived need be recognized on the hill shaded image. Second, with a given direction of illumination, these terrain forms disappear in the direction which coincides with the lighting direction. A modified algorithm was implemented and correct shaded relief images are shown that compensate for these effects. Author (ESA)

N82-24613# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
RELATIONS IN RASTERS [RELATIONEN IM RASTER]
Hans-Joerg Gottschalk *In its* Repts. on Cartography and Geodesy. Ser. 1: Original Repts., No. 82 1981 p 35-54 refs In GERMAN; ENGLISH summary (For primary document see N82-24610 15-43)
Avail: NTIS HC A06/MF A01

Optimal algorithms for structuring data are investigated and the local properties of binary images in two dimensions are considered. The vicinity of a point can be determined by the Thiessen polygon. All points within the Thiessen polygon around a point A lie closer to point A than to all other points of the point accumulation taken. Corresponding polygons can also be defined for points given in regular rasters. Simple algorithms for the determination of the surrounding polygons are given and discussed. In this connection, possible triangulation of point accumulations is demonstrated, using raster images.
Author (ESA)

N82-24614# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
LINE SMOOTHING IN RASTERS [DIE GLAETTUNG VON LINIEN IM RASTER]
Hans-Joerg Gottschalk *In its* Repts. on Cartography and Geodesy. Ser. 1: Original Repts., No. 82 1981 p 55-65 refs In GERMAN; ENGLISH summary (For primary document see N82-24610 15-43)
Avail: NTIS HC A06/MF A01

An arithmetic averaging technique for the smoothing of cartographic lines as an auxiliary aid in generalization is presented. Line data in raster form were treated, using an array processor. Contour and hydrographic maps were generated and evaluated. Results show that this method of processing sequential data is suitable for cartographic generalization of raster images.
Author (ESA)

N82-24615# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
THE EUROPEAN SPACE REMOTE SENSING PROGRAM [DAS EUROPAEISCHE WELTRAUM-FERNERKUNDUNGS-PROGRAMM]
Gottfried Konecny *In its* Repts. on Cartography and Geodesy. Ser. 1: Original Repts., No. 82 1981 p 67-116 In GERMAN; ENGLISH summary (For primary document see N82-24610 15-43)
Avail: NTIS HC A06/MF A01

The possibilities of spaceborne Earth sensing are analyzed. Photogrammetric capabilities of different satellites are emphasized. Configurations that produce imagery for geometric and radiometric measurements as well as for interpretation of objects are identified, including weather satellites, automatic Earth observation satellites, reconnaissance satellites, and manned orbital missions. Remote sensing program accomplishments and planning in the U.S. and in other countries are reviewed and compared, with consideration of financial aspects. The various sensors and Earth observation methods are described in terms of performance and efficiency. Results show that satellite photogrammetry can be used for the production of topographic maps. Satellite imagery is also suitable for the purposes of resources management. Author (ESA)

N82-24616# Institut fuer Angewandte Geodaesie, Frankfurt am Main (West Germany).
CPF-AB: A REPRODUCTION FILM FROM AGFA/GEVAERT BASED ON THE DIFFUSION METHOD [CPF-AB - EIN ABZIEHFILM VON AGFA/GEVAERT AUF DER BASIS DES DIFFUSIONSVERFAHRENS]
Hans Guenter Lay *In its* Repts. on Cartography and Geodesy. Ser. 1: Original Repts., No. 82 1981 p 107-116 In GERMAN; ENGLISH summary (For primary document see N82-24610 15-43)
Avail: NTIS HC A06/MF A01

Strip films are of interest in cartography for mounting purposes. A product incorporated in the Agfa/Gevaert copyproof-system is discussed. The special properties of this film are highlighted. Cartographic products obtained with this film are compared to those generated by more usual methods of adhesive mounting with waxed strip films. Results show improvements in contrast and resolution. Author (ESA)

N82-24617# Coastal Engineering Research Center, Fort Belvoir, Va. Engineering Development Div.
BASE MAP ANALYSIS OF COASTAL CHANGES USING AERIAL PHOTOGRAPHY
Craig Hamilton Everts and Deborah C. Wilson Nov. 1981 15 p refs
(AD-A110497; CERC-TP-81-4) Avail: NTIS HC A02/MF A01 CSCL 08/6

Time-sequence aerial photos often constitute the only source of data to determine past shoreline changes. This report presents a method for obtaining shoreline change data from base maps constructed from time-sequence sets of aerial photos, with the image of the aerial photos superimposed at the constant scale of each base map. Shoreline position and other features of interest, such as vegetation line location and orientation of breaking wave crests near the coast, etc., are then traced on each base map. A comparison of each base map from the different sets of aerial photos will provide shoreline change data through time.
Author (GRA)

N82-24618# Army Cold Regions Research and Engineering Lab., Hanover, N. H. Geophysical Sciences Branch.
NEAR-INFRARED REFLECTANCE OF SNOW COVERED SUBSTRATES
Harold W. OBrien and Gary Koh Nov. 1981 24 p refs
(DA Proj. 4A1-61102-AT-24)
(AD-A110868; CRREL-81-21) Avail: NTIS HC A02/MF A01 CSCL 08/12

The reflection of solar radiation by a snow cover in situ and the apparent influence of selected substrates were examined in wavelength bands centered at 0.81, 1.04, 1.10, 1.30, 1.50 and 1.80 micrometers. Substrates included winter wheat, timothy, corn, alfalfa, grass, concrete and subsurface layers of 'crusty' snow and ice. Reasonable qualitative agreement between measurements and theoretical predictions was demonstrated, with indications of quantitative agreement in the definition of a 'semi-infinite depth' of snow cover. It was concluded that ultimate quantitative agreement between theory and measurement will require that an 'optically effective grain size' be defined in terms of physically measurable dimensions or meteorologically predictable characteristics of the ice crystals composing the snowpack. Author (GRA)

N82-24619# Oak Ridge Gaseous Diffusion Plant, Tenn. Uranium Resource Evaluation Project.
HYDROGEOCHEMICAL AND STREAM SEDIMENT RECONNAISSANCE BASIC DATA FOR O'NEILL NTMS QUADRANGLE, SOUTH DAKOTA; NEBRASKA
30 Jun. 1981 229 p refs
(Contract W-7405-eng-26)
(DE82-000326; GJBX-307-81) Avail: NTIS HC A11/MF A01

Results of a reconnaissance geochemical survey of the O'Neill Quadrangle are reported. Field and laboratory data are presented for 23 groundwater and 292 stream sediment samples. Statistical distributions and symbol plots for uranium and possible uranium related variables are enclosed. A generalized geologic map and producing horizon map for the survey area are provided. Pertinent geologic factors which may be of significance in evaluating the potential for uranium mineralization are discussed. Groundwater samples were collected only in the South Dakota portion of the quadrangle. Stream sediment data indicate that uranium values above the 85th percentile occur in two areas along the Missouri Trench and along the trace of the Niobrara River. High uranium values along the Missouri Trench are associated with upper cretaceous shales and marls and those along the Niobrara River with pleistocene deposits. DOE

N82-24620# Western Geophysical Co. of America, Houston, Tex. Aero Service Div.
AIRBORNE GAMMA-RAY SPECTROMETER AND MAGNETOMETER SURVEY. IKPIKPUK RIVER QUADRANGLE, ALASKA, VOLUME 2 Final Report
Feb. 1981 108 p
(Contract DE-AC13-76GJ-01664)
(DE82-000314; GJBX-304-81-Vol-2) Avail: NTIS HC A06/MF A01

The flight path map, multiparameter profiles, histograms, and anomaly maps for uranium, thorium, potassium, uranium/potassium, uranium/thorium, d thorium/potassium are presented. Data was gathered during airborne gamma ray spectrometer and magnetometer survey flights over Alaska. DOE

N82-24621# Grumman Aerospace Corp., Bethpage, N.Y. Research Dept.
STUDY OF THE USE OF A PHOSWICH DETECTOR FOR AERIAL RADIOMETRIC SURVEYS
E. J. Schneid and L. J. Lagin Sep. 1981 199 p refs
(Contract DE-AC13-76GJ-01664)
(DE82-001787; GJBX-292-81; RE-633) Avail: NTIS HC A09/MF A01

Large volume, actively shielded Phoswich detector configurations were investigated for application in airborne radiometric survey systems in order to increase the sensitivity to ground-level potassium, uranium, and thorium compared to conventional sodium detectors of similar sizes. One Phoswich configuration was fabricated and flight tested. The tests demonstrated that the Phoswich detector can function in an operational environment and does provide greater sensitivity to ground-level potassium, uranium, and thorium concentration than the conventional sodium detector. The multicrystal configuration for the Phoswich detector provided the capability to simultaneously measure the atmospheric radon background without the need of heavy lead shields. The flight tests indicated that the Phoswich detector has directional discrimination capability can be used to distinguis the location, relative to the aircraft, of localized strong sources of radiation.
DOE

N82-24622# Bendix Field Engineering Corp., Grand Junction, Colo.
AERIAL GAMMA-RAY AND MAGNETIC SURVEY: TOLEDO QUADRANGLE, OHIO AND MICHIGAN Final Report
Jun. 1981 202 p refs
(Contract DE-AC13-76GJ-01664)
(DE81-027186; GJBX-210-81) Avail: NTIS HC A10/MF A01

The Toledo quadrangle of Ohio, Michigan, and Ontario, Canada covers 7,100 square miles of the Midwestern Physiographic Province. Moderate to thick Paleozoic strata overlie Precambrian basement, with Quaternary glacial sediments covering the entire quadrangle surface. Thirty uranium anomalies were detected and are discussed. Radiometric data reflect differences in material between morainal and lacustrine deposits. All anomalies appear to be related to cultural features. Magnetic data appear to be in agreement with existing structural interpretation of the area, with the exception of one isolated feature. This feature is attributed to lithologic and/or structural complexities in the precambrian basement. DOE

N82-24623# High Life Helicopters, Inc., Puyallup, Wash.
AIRBORNE GAMMA-RAY SPECTROMETER AND MAGNETOMETER SURVEY, GLENDIVE QUADRANGLE, MONTANA, VOLUME 2A Final Report
1981 159 p refs Prepared in cooperation with QEB, Inc., Lakewood, Colo.
(Contract DE-AC13-76GJ-01664)
(GJBX-180-81-Vol-2A) Avail: NTIS HC A08/MF A01

Forty-four uranium anomalies which meet the minimum statistical requirements are reported. These anomalies were tabulated and are shown on the Uranium Anomaly Interpretation Map. Potassium (%K), equivalent Uranium (ppM eU), equivalent Thorium (ppM eT), eU/eT, eU/K, eT/K, and magnetic pseudocontour maps are presented. Stacked profiles showing geologic strip maps along each flight-line, together with sensor data, and ancillary data are also presented. All maps and profiles were prepared on a scale of 1/250,000, but were reduced to 1/500,000. Anomalies No. 1 to No. 13 are over areas underlain by the Tertiary Fort Union formation (Tfutr and Tfulw). The lignites in this formation are commonly uranium-bearing. Anomaly No. 14 is over an area underlain by Recent terrace deposits (Qt). Anomalies No. 15 to No. 18, and No. 21 are over areas underlain by the Tertiary Fort Union formation (Tfutr). T.M.

N82-24624# High Life Helicopters, Inc., Puyallup, Wash.
AIRBORNE GAMMA-RAY SPECTROMETER AND MAGNETOMETER SURVEY: ELMIRA QUADRANGLE (NEW YORK) Final Report
1981 161 p refs Prepared in cooperation with QEB, Inc., Lakewood, Colo.
(Contract DE-AC13-79GJ-01692)
(DE81-027160; GJBX-211-81-Vol-2E) Avail: NTIS HC A08/MF A01

Ten uranium anomalies which meet the minimum statistical requirements are reported. These anomalies were tabulated and

are shown on the Uranium Anomaly Interpretation Map. Potassium (%K), equivalent Uranium (ppm eU), equivalent Thorium (ppm eTh), eU/eTh, eU/K, eTh/K, and magnetic pseudo-contour maps are presented. Stacked profiles showing geologic strip maps along each flight-line, together with sensor data, and ancillary data are also presented. All maps and profiles were prepared on a scale of 1:250,000, but have been reduced to 1:500,000. Anomalies number 1 to number 3 are over areas underlain by shales and sandstones of the upper Devonian Nunda Formation (Dwn). Anomaly number 4 is over an area underlain by shales and sandstones of the upper Devonian Conneaut Group (Dct). Anomaly number 5 is over an area underlain by upper Devonian Beers Hill Shale, Dunn Hill Shale, Millport Shale, and Moreland Shale (Dwr). T.M.

N82-24625# Oak Ridge Gaseous Diffusion Plant, Tenn. Uranium Resource Evaluation Project.

HYDROGEOCHEMICAL AND STREAM SEDIMENT RECONNAISSANCE BASIC DATA FOR ROUNDUP QUADRANGLE, MONTANA

31 Aug. 1981 252 p refs
(Contract W-7405-eng-26)
(DE82-002665; GJBX-361-81; K/UR-385) Avail: NTIS HC A12/MF A01

Data for 1263 water samples and 961 sediment samples from the Roundup Quadrangle, Montana are presented. Laboratory analysis and data reporting and the final data base used to generate the tables are completed. The national uranium resource evaluation (NURE) program assesses uranium resources and identifies favorable areas for uranium exploration. The NURE program consists of: (1) hydrochemical and stream sediment reconnaissance (HSSR) program; (2) aerial radiometric and magnetic survey; (3) surface geologic investigations; (4) drilling for geologic information; and (5) geophysical technology development. DOE

N82-24626# Oak Ridge Gaseous Diffusion Plant, Tenn. Uranium Resource Evaluation Project.

HYDROGEOCHEMICAL AND STREAM SEDIMENT RECONNAISSANCE BASIC DATA FOR KATEEL RIVER QUADRANGLE, ALASKA

31 Aug. 1981 102 p refs
(Contract W-7405-eng-26)
(DE82-002468; GJBX-360-81; K/UR-373) Avail: NTIS HC A06/MF A01

Water samples from the Kateel River Quadrangle, Alaska were analyzed in relation to uranium exploration. Samples include surface water, groundwater, stream sediments, and lake sediments. DOE

N82-24627# Oak Ridge Gaseous Diffusion Plant, Tenn. Uranium Resource Evaluation Project.

HYDROGEOCHEMICAL AND STREAM SEDIMENT RECONNAISSANCE BASIC DATA FOR CLIFTON QUADRANGLE, NEW MEXICO; ARIZONA

31 Jul. 1981 158 p refs
(Contract W-7405-eng-26)
(DE82-002465; GJBX-359-81) Avail: NTIS HC A08/MF A01

Field and laboratory data are presented for 451 water samples and 900 sediment samples from the Clifton Quadrangle, New Mexico; Arizona. Uranium values were reported by Los Alamos National Laboratory. The samples were collected by Los Alamos National Laboratory; laboratory analysis and data reporting were performed by the uranium resource evaluation project. DOE

N82-24628# Oak Ridge Gaseous Diffusion Plant, Tenn. Uranium Resource Evaluation Project.

HYDROGEOCHEMICAL AND STREAM SEDIMENT RECONNAISSANCE BASIC DATA FOR RATON QUADRANGLE, NEW MEXICO

31 Aug. 1981 211 p refs
(Contract W-7405-eng-26)
(DE82-002466; GJBX-358-81) Avail: NTIS HC A10/MF A01

Water samples and sediment samples from the Raton Quadrangle, New Mexico were analyzed in relation to uranium exploration. Uranium values were reported. Samples include surface water, ground water, stream sediments and lake sediments. DOE

N82-24629# . Western Geophysical Co. of America, Houston, Tex. Aero Service Div.

AIRBORNE GAMMA-RAY SPECTROMETER AND MAGNETOMETER SURVEY. JAMESTOWN QUADRANGLE, NORTH DAKOTA, VOLUME 1 Final Report

Mar. 1981 85 p refs 2 Vol.
(Contract DE-AC13-76GJ-01664)
(DE82-004150; GJBX-353-81-Vol-1) Avail: NTIS HC A05/MF A01

During the months of June through October, 1980 an airborne high sensitivity gamma-ray spectrometer and magnetometer survey over eleven 20 x 10 quadrangles located in the states of Minnesota and Wisconsin and seven 20 x 10 quadrangles in North and South Dakota was conducted. The results obtained over the Jamestown map area of North Dakota are discussed. The final data are presented in four different forms: on magnetic tape; on microfiche; in graphic form as profiles and histograms; and in map form as anomaly maps, flight path maps, and computer printer maps. DOE

N82-24630# Western Geophysical Co. of America, Houston, Tex. Aero Service Div.

AIRBORNE GAMMA-RAY SPECTROMETER AND MAGNETOMETER SURVEY. JAMESTOWN QUADRANGLE, NORTH DAKOTA, VOLUME 2 Final Report

Mar. 1981 100 p 2 Vol.
(Contract DE-AC13-76GJ-01664)
(DE82-004169; GJBX-353-81-Vol-2) Avail: NTIS HC A05/MF A01

The flight path map, radiometric multiple-parameter stacked profiles, magnetic and ancillary parameter stacked profiles, histograms, anomaly maps for uranium, thorium, potassium, uranium/thorium, thorium/potassium, and uranium/potassium are given. Data was obtained during an airborne gamma-ray spectrometer and magnetometer survey of North Dakota. DOE

N82-24631# Western Geophysical Co. of America, Houston, Tex. Aero Service Div.

AIRBORNE GAMMA-RAY SPECTROMETER AND MAGNETOMETER SURVEY. UMIAT QUADRANGLE, ALASKA, VOLUME 1 Final Report

Mar. 1981 104 p refs 2 Vol.
(Contract DE-AC13-76GJ-01664)
(DE82-000336; GJBX-305-81-Vol-1) Avail: NTIS HC A06/MF A01

During the months of July and August of 1980, an airborne high sensitivity gamma ray spectrometer and magnetometer survey over eleven 30 x 10 and one 40 x 10 NTMS quadrangles of the Alaska North Slope was conducted. The results obtained over the Umiat map are discussed. The final data are presented in four different forms: on magnetic tape; on microfiche; in graphic form as profiles and histograms; and in map form as anomaly maps, flight path maps, and computer printer maps. Complete data listings of both the reduced single record and the reduced averaged record data are also presented. DOE

N82-24632# Western Geophysical Co. of America, Houston, Tex. Aero Service Div.

AIRBORNE GAMMA-RAY SPECTROMETER AND MAGNETOMETER SURVEY. UMIAT QUADRANGLE, ALASKA, VOLUME 2 Final Report

Feb. 1981 106 p refs 2 Vol.
(Contract DE-AC13-76GJ-03664)
(DE82-000312; GJBX-305-81-Vol-2) Avail: NTIS HC A06/MF A01

The flight path map, multiparameter profiles, histograms, and anomaly maps are presented for uranium, thorium, potassium, uranium/potassium, uranium/thorium, and thorium/potassium. This data was obtained using an airborne gamma spectrometer and magnetometer. DOE

N82-24633# Research Inst. of National Defence, Stockholm (Sweden).

REMOTE SENSORS APPLICATIONS AT THE NORWEGIAN DEFENSE RESEARCH INSTITUTE [FJAERRANALYSTIL-

LAEMPNINGAR VID FOERSVARETS FORSKNINGSINSTITUT I NORGE]
Anders Wellving Feb. 1982 9 p refs In SWEDISH
(FOA-C-20441-D8) Avail: NTIS HC A02/MF A01

The remote sensing of natural phenomena is considered. Terrain analysis and the measurement of noctural luminous intensity with or without nightglow are discussed. Digital radar mapping, snow detection, radar snow depth measurement and computer assisted geographic applications are described.
Author (ESA)

N82-24634# National Academy of Sciences - National Research Council, Washington, D. C. Water Resources Research Review Committee.
FEDERAL WATER RESOURCES RESEARCH: A REVIEW OF THE PROPOSED FIVE-YEAR PROGRAM PLAN
1981 92 p refs
(Contract DI-14-34-0001-0426)
(PB82-135559; W82-01051; OWRT-C-00086-G-0426(1))
Avail: NTIS HC A05/MF A01 CSCL 13B

The Water Resources Research Review Committee studied the 1975 assessment of the nation's water resources by the U.S. Water Resources Council and other recent reports that highlight pressing water problems. The Committee then developed criteria by which to determine the research areas of highest priority. Using these criteria, the Committee identified thirty-one research areas where emphasis should be placed in programming water resources research over the next five years. The thirty-one research areas are described in relation to the professional disciplines in the report. GRA

N82-24635# New England River Basins Commission, Boston, Mass.
LAKE MEMPHREMAGOG-SAINT FRANCIS RIVER BASIN OVERVIEW
May 1981 166 p refs Sponsored in part by Water Resources Council
(PB82-108101) Avail: NTIS HC A08/MF A01 CSCL 08H

The St. Francis River basin drains 6,343 square miles in southern Quebec and northeastern Vermont, including Lake Memphremagog, an international lake with headwaters in Vermont and the outlet in Quebec. Although not subject to intense development pressures, the basin does experience water related problems with fluctuating lake levels (levels in Lake Memphremagog are now regulated under a 1935 international agreement), water pollution, and fisheries, particularly flow and passage problems on the Clyde River. GRA

N82-24636# New England River Basins Commission, Boston, Mass.
ANDROSCOGGIN RIVER BASIN OVERVIEW
Sep. 1981 195 p refs Sponsored in part by Water Resources Council
(PB82-107137) Avail: NTIS HC A09/MF A01 CSCL 08H

Some 3,450 square miles in New Hampshire and Maine are drained by the Androseoggin River whose flows are largely controlled by dams at six headwater lakes. Major water resource problems in the basin include competing demands for fisheries, recreation, and new hydropower development. A river basin management study to meet multiple objectives is recommended. GRA

N82-24637# Bureau of Reclamation, Denver, Colo. Engineering and Research Center.
COLORADO RIVER SIMULATION SYSTEM: AN EXECUTIVE SUMMARY
Michael S. Cowan, R. Wayne Cheney, and Jeffrey C. Addiego 1981 19 p
(PB82-139387) Avail: NTIS HC A02/MF A01 CSCL 08H

The CRSS (Colorado River Simulation System), a deterministic digital computerized simulation model was developed by the Bureau of Reclamation in accordance with all the 'Laws of the River'. With CRSS proposed changes to the operation or alternative development schemes of the river system can be modeled and their effect on the future quantity and quality of water in the river may be evaluated. GRA

N82-24638# Geological Survey, Lawrence, Kans. Water Resources Div.
SELECTED HYDROLOGIC RELATIONSHIPS FOR SOLDIER CREEK, NORTHEASTERN KANSAS Final Water Resources Investigations
William J. Carswell, Jr. Apr. 1981 69 p refs Sponsored in part by Kansas Water Resources Board
(PB82-138751; USGS/WRD/WRI-81-099; USGS-WRI-81-8)
Avail: NTIS HC A04/MF A01 CSCL 08H

Hydrologic data from Soldier Creek basin were compared with relations from statewide data. The quantity and quality of streamflow were affected mostly by soils, slopes, and land use. Average annual precipitation during the study (1964-76) was 35.12 inches, or 2.3 percent greater than the long term (1929-76) average. The average streamflow in Soldier Creek at Topeka, Kansas, was 23 percent greater than the long term average, in general, frequency curves of annual peak discharges compared poorly with curves from statewide relations due to the absence of extremely low peaks during the short period. GRA

N82-24263# Joint Publications Research Service, Arlington, Va.
COST-EFFECTIVENESS OF GEOGRAPHIC SURVEYING FROM SPACE
M. Ya. Lemeshev, Yu. V. Sukhotin, and A. F. Demidov *In its* USSR Rept.: Space, No. 15 (JPRS-80424) 29 Mar. 1982 p 76-96 refs Transl. into ENGLISH from Ekon. Mat. Metody (USSR), v. 17, no. 5, Sep. - Oct. 1981 p 920-935 (For primary document see N82-24253 15-12)
Avail: NTIS HC A07/MF A01

44 ENERGY PRODUCTION AND CONVERSION

Includes specific energy conversion systems, e.g., fuel cells and batteries; global sources of energy; fossil fuels; geophysical conversion; hydroelectric power; and wind power.

For related information see also *07 Aircraft Propulsion and Power, 20 Spacecraft Propulsion and Power, 28 Propellants and Fuels,* and *85 Urban Technology and Transportation.*

N82-24639* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
AMPLIFIED WIND TURBINE APPARATUS Patent
Leopold A. Hein and William N. Myers, inventors (to NASA) Issued 5 Jan. 1982 8 p Filed 12 Mar. 1980 Supersedes N80-21831 (18 - 12, p 1597)
(NASA-Case-MFS-23830-1; US-Patent-4,309,146; US-Patent-Appl-SN-129780; US-Patent-Class-415-2R; US-Patent-Class-415-DIG.8) Avail: US Patent and Trademark Office CSCL 10B

An invention related to the utilization of wind energy and increasing the effects thereof for power generation is described. Amplified wind turbine apparatus is disclosed wherein ambient inlet air is prerotated in a first air rotation chamber having a high pressure profile increasing the turbulence and Reynolds number thereof. A second rotation chamber adjacent and downstream of the turbine has a low pressure core profile whereby flow across the turbine is accelerated and thereafter exits the turbine apparatus through a draft anti-interference device. Interference with ambient winds at the outlet of the turbine apparatus is thus eliminated. Pivotable vanes controlled in response to prevailing wind direction admit air to the chambers and aid in imparting rotation. A central core may be utilized for creating the desired pressure profile in the chamber. M.D.K.

N82-24640* National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
SOLAR ENGINE Patent
Ronald N. Jensen, inventor (to NASA) Issued 27 Apr. 1981 6 p Filed 22 Jun. 1979 Supersedes N79-29608 (17 - 20, p 2692)
(NASA-Case-LAR-12148-1; US-Patent-4,326,381;

US-Patent-Appl-SN-051275; US-Patent-Class-60-641.14; US-Patent-Class-60-516) Avail: US Patent and Trademark Office CSCL 10B

A solar engine is disclosed in which a fluid, which is first heated and then cooled, forces a piston outward as the fluid is heated, and then draws the piston inward as the fluid is cooled. The piston is connected to a shaft and produces work as it moves outward and inward. A displacer plate moves between an absorber plate and a cooling plate to form an air space between the displacer and one or the other of these two plates for heating and cooling the fluid. The displacer plate is moved from one plate to the other by the displacer push ring as the piston nears the midpoint of its travel on the outward stroke and again on the inward stroke.

Official Gazette of the US Patent and Trademark Office

N82-24641* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

PROCESS OF TREATING CELLULOSIC MEMBRANE AND ALKALINE WITH MEMBRANE SEPARATOR Patent

Howard Eugene Hoyt (Borden, Inc., New York) and Helmuth Louis Pfluger, inventors (to NASA) (Borden, Inc., New York) Issued 3 Mar. 1970 3 p Filed 2 Nov. 1967 Sponsored by NASA (NASA-Case-GSC-10019-1; US-Patent-3,498,841; US-Patent-Appl-SN-680048; US-Patent-Class-136-6) Avail: US Patent and Trademark Office CSCL 10C

The improvement of water-soluble cellulose ether membranes for use as separators in concentrated alkaline battery cells is discussed. The process of contacting membranes with an aqueous alkali solution of concentration less than that of the alkali solution to be used in the battery but above that at which the membrane is soluble is described.

Official Gazette of the U.S. Patent and Trademark Office

N82-24642* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

SEPARATOR FOR ALKALINE BATTERIES AND METHOD OF MAKING SAME Patent

Howard Eugene Hoyt (Borden, Inc., New York) and Helmuth Louis Pfluger, inventors (to NASA) (Borden, Inc. New York) Issued 3 Mar. 1970 3 p Filed 2 Nov. 1967 Sponsored by NASA (NASA-Case-GSC-10350-1; US-Patent-3,498,840; US-Patent-Appl-SN-679980; US-Patent-Class-136-6) Avail: US Patent and Trademark Office CSCL 10C

The preparation of membanes suitable for use as separators in concentrated alkaline battery cells by selective solvolysis of copolymers of methacrylate esters with acrylate esters followed by addition of a base and to the resultant products is described. The method of making copolymers by first copolymerizing a methacrylate ester (or esters) with a more readily hydrolyzable ester, followed by a selective saponification whereby the methacrylate ester moieties remain essentially intact and the readily hydrolyzable ester moiety is suponified and to the partial or complete neutralization of the relatively brittle copolymer acid with a base to make membranes which are sufficiently flexible in the dry state so that they may be wrapped around electrodes without damage by handling is described.

Official Gazette of the U.S. Patent and Trademark Office

N82-24643* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

SEPARATOR FOR ALKALINE ELECTRIC CELLS AND METHOD OF MAKING Patent

Helmuth Louis Pfluger (Borden, Inc., New York) and Howard Eugene Hoyt, inventors (to NASA) (Borden, Inc., New York) Issued 7 Jul. 1970 3 p Filed 2 Nov. 1967 Sponsored by NASA (NASA-Case-GSC-10017-1; US-Patent-3,519,484; US-Patent-Appl-SN-679996; US-Patent-Class-136-6) Avail: US Patent and Trademark Office CSCL 10A

Modified cellulose ether films having an increased electrolytic conductivity and a useable flexibility and in certain instances an increased flexibility are presented. Battery separator membranes comprising a cellulose ether and a minor proportion of a compatible water soluble base selected from the group consisting of alkali metal and ammonium hydroxides, aliphatic amines, and aliphatic hydroxyamines are used.

Official Gazette of the U.S. Patent and Trademark Office

N82-24644* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

SEPARATOR FOR ALKALINE ELECTRIC BATTERIES AND METHOD OF MAKING Patent

Helmuth Louis Pfluger (Xorden, Inc., New York) and Howard Eugene Hoyt, inventors (to NASA) (Borden, Inc., New York) Issued 7 Jul. 1970 3 p Filed 2 Nov. 1967 Sponsored by NASA (NASA-Case-GSC-10018-1; US-Patent-3,519,483; US-Patent-Appl-SN-679987; US-Patent-Class-136-6) Avail: US Patent and Trademark Office CSCL 10C

Battery separator membranes of high electrolytic conductivity comprising a cellulose ether and a compatible metallic salt of water soluble aliphatic acids and their hydroxy derivatives are described. It was found that methyl cellulose can be modified by another class of materials, nonpolymeric in nature, to form battery separator membranes of low electrolytic resistance but which have the flexibility of membranes made of unmodified methyl cellulose, and which in many cases enhance flexibility over membranes made with unmodified methyl cellulose. Separator membranes for electrochemical cells comprising a cellulose ether and a modified selected from the group consisting of metallic salts of water soluble alphatic acids and their hydroxy derivatives and to electrochemical cells utilizing said membranes are described.

Official Gazette of the U.S. Patent and Trademark Office

N82-24645* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

ALKALINE ELECTROCHEMICAL CELLS AND METHOD OF MAKING Patent

Howard Eugene Hoyt (Borden, Inc., New York) and Helmuth Louis Pfluger, inventors (to NASA) (Borden, Inc., New York) Issued 14 Apr. 1970 3 p Filed 8 Aug. 1967 (NASA-Case-GSC-10349-1; US-Patent-3,506,496; US-Patent-Appl-SN-658999; US-Patent-Class-136-148) Avail: US Patent and Trademark Office CSCL 10C

Equilibrated cellulose ether membranes of increased electrolytic conductivity for use as separators in concentrated alkaline electrochemical cells are investigated. The method of making such membranes by equilibration to the degree desired in an aqueous alkali solution mantained at a temperature below about 10 C is described.

Official Gazette of the U.S. Patent and Trademark Office

N82-24646*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

[SUBSYSTEMS DESIGN AND COMPONENT DEVELOPMENT FOR THE PARABOLIC DISH MODULE FOR SOLAR THERMAL POWER SYSTEMS] Annual Technical Report

C. K. Stein 15 Mar. 1982 30 p Prepared in cooperation with NASA. Lewis Research Center (Contracts NAS7-10; DE-AT04-81AL-16228) (NASA-CR-168941; DOE/JPL-1060-51; JPL-Pub-82-22; NAS 1.26:168941) Avail: NTIS HC A03/MF A01 CSCL 10A

Solar thermal power systems parabolic dish activities are summarized. Subsystem designs of concentrators, receivers, engines, power converters, and thermal transport are discussed. Analyses, test results, field tests, small community system development and the parabolic dish test site are also included.

Author

N82-24647*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

DESIGN OF A 35-KILOWATT BIPOLAR NICKEL-HYDROGEN BATTERY FOR LOW EARTH ORBIT APPLICATION

Robert L. Cataldo and John J. Smithrick 1982 10 p refs To be presented at the 17th Intersoc. Energy Conversion Eng. Conf., Los Angeles, 8-13 Aug. 1982; sponsored by IEEE, AIAA, ACS, AIChE, ANS, ASME and SAE (NASA-TM-82844; E-1214; NAS 1.15:82844) Avail: NTIS HC A02/MF A01 CSCL 10C

The needs of multikilowatt storage for low Earth orbit applications are featured. The modular concept, with projected energy densities of 20-24 W-hr/lb and 700-900 W-hr/ft3, has significant improvements over state of the art capabilities. Other design features are; active cooling, a new scheme for H2-O2 recombination, and pore size engineering of all cell components.

T.M.

N82-24648*# Engelhard Industries, Inc., Edison, N.J.
DEVELOP AND TEST FUEL CELL POWERED ON-SITE INTEGRATED TOTAL ENERGY SYSTEMS: PHASE 3: FULL-SCALE POWER PLANT DEVELOPMENT Quarterly Report, Aug. - Oct. 1981
28 Apr. 1982 59 p refs
(Contracts DEN3-241; DE-AI-01-80ET-17088)
(NASA-CR-165568; DOE/NASA/0241-3; NAS 1.26:165568; QR-3) Avail: NTIS HC A04/MF A01 CSCL 10B

The development of a commercially viable and cost-effective phospheric acid fuel cell powered on-site integrated energy system (OS/IES) is described. The fuel cell offers energy efficients in the range of 35-40% of the higher heating value of available fuels in the form of electrical energy. In addition, by utilizing the thermal energy generated for heating, ventilating and air-conditioning (HVAC), a fuel cell OS/IES could provide total energy efficiencies in the neighborhood of 80%. Also, the Engelhard fuel cell OS/IES offers the important incentive of replacing imported oil with domestically produced methanol, including coal-derived methanol. T.M.

N82-24649*# Parsons (Ralph M.) Co., Pasadena, Calif.
FUEL QUALITY PROCESSING STUDY, VOLUME 1 Final Report
J. B. OHara, A. Bela, N. E. Jentz, H. T. Syverson, H. W. Klumpe, R. E. Kessler, H. T. Kotzot, and B. L. Loran Apr. 1981 203 p refs 2 Vol.
(Contracts DEN3-183; DE-AI01-77ET-13111)
(NASA-CR-165327-Vol-1; DOE/NASA/0183-1; NAS 1.26:165327-Vol-1) Avail: NTIS HC A10/MF A01 CSCL 21D

A fuel quality processing study to provide a data base for an intelligent tradeoff between advanced turbine technology and liquid fuel quality, and also, to guide the development of specifications of future synthetic fuels anticipated for use in the time period 1985 to 2000 is given. Four technical performance tests are discussed: on-site pretreating, existing refineries to upgrade fuels, new refineries to upgrade fuels, and data evaluation. The base case refinery is a modern Midwest refinery processing 200,000 BPD of a 60/40 domestic/import petroleum crude mix. The synthetic crudes used for upgrading to marketable products and turbine fuel are shale oil and coal liquids. Of these syncrudes, 50,000 BPD are processed in the existing petroleum refinery, requiring additional process units and reducing petroleum feed, and in a new refinery designed for processing each syncrude to produce gasoline, distillate fuels, resid fuels, and turbine fuel, JPGs and coke. An extensive collection of synfuel properties and upgrading data was prepared for the application of a linear program model to investigate the most economical production slate meeting petroleum product specifications and turbine fuels of various quality grades. Technical and economic projections were developed for 36 scenarios, based on 4 different crude feeds to either modified existing or new refineries operated in 2 different modes to produce 7 differing grades of turbine fuels. A required product selling price of turbine fuel for each processing route was calculated. Procedures and projected economics were developed for on-site treatment of turbine fuel to meet limitations of impurities and emission of pollutants. R.J.F.

N82-24650*# Parsons (Ralph M.) Co., Pasadena, Calif.
FUEL QUALITY/PROCESSING STUDY. VOLUME 2: APPENDIX. TASK 1 LITERATURE SURVEY Final Report
J. B. OHara, A. Bela, N. E. Jentz, H. W. Klumpe, H. E. Kessler, H. T. Kotzot, and B. L. Loran Apr. 1981 274 p refs 2 Vol.
(Contract DEN3-183; DE-AI01-77ET-13111)
(NASA-CR-165327-Vol-2; DOE/NASA/0183-1; NAS 1.26:165327-Vol-2) Avail: NTIS HC A12/MF A01 CSCL 21D

The results of a literature survey of fuel processing and fuel quality are given. Liquid synfuels produced from coal and oil shale are discussed. Gas turbine fuel property specifications are discussed. On-site fuel pretreatment and emissions from stationary gas turbines are discussed. Numerous data tables and abstracts are given. R.J.F.

N82-24651*# General Electric Co., Schenectady, N. Y. Gas Turbine Div.
LOW NOx HEAVY FUEL COMBUSTOR CONCEPT PROGRAM, PHASE 1 Final Report
Martin B. Cutrone Oct. 1981 251 p
(Contracts DEN3-147; DE-AI01-77ET-13111)
(NASA-CR-165449; DOE/NASA/0147-1; NAS 1.26:165449)
Avail: NTIS HC A12/MF A01 CSCL 10B

Combustion tests were completed with seven concepts, including three rich/lean concepts, three lean/lean concepts, and one catalytic combustor concept. Testing was conducted with ERBS petroleum distillate, petroleum residual, and SRC-II coal-derived liquid fuels over a range of operating conditions for the 12:1 pressure ratio General Electric MS7001E heavy-duty turbine. Blends of ERBS and SRC-II fuels were used to vary fuel properties over a wide range. In addition, pyridine was added to the ERBS and residual fuels to vary nitrogen level while holding other fuel properties constant. Test results indicate that low levels of NOx and fuel-bound nitrogen conversion can be achieved with the rich/lean combustor concepts for fuels with nitrogen contents up to 1.0% by weight. Multinozzle rich/lean Concept 2 demonstrated dry low Nox emissions within 10-15% of the EPA New Source Performance Standards goals for SRC-II fuel, with yields of approximately 15%, while meeting program goals for combustion efficiency, pressure drop, and exhaust gas temperature profile. Similar, if not superior, potential was demonstrated by Concept 3, which is a promising rich/lean combustor design. T.M.

N82-24652# Courtesy Associates, Inc., Washington, D.C.
PROCEEDINGS OF THE DOE THERMAL AND CHEMICAL STORAGE ANNUAL CONTRACTOR'S REVIEW MEETING
Mar. 1981 361 p refs Meeting held at McLean, Va., 14-16 Oct. 1980 Prepared for Brookhaven National Lab.
(Contract DE-AC02-76CH-00016)
(CONF-801055) Avail: NTIS HC A16/MF A01

Overviews of Thermal Energy Storage and Chemical/Hydrogen Energy Storage Programs are presented. The progress and accomplishments of each subcontractor, program management and interested researchers from industry, academia, and government are summarized. For individual titles, see N82-24653 through N82-24715.

N82-24653# Department of Energy, Washington, D. C. Thermal and Chemical Storage Branch.
OVERVIEW OF THE THERMAL ENERGY STORAGE (TES) PROGRAM
Michael Gurevich *In* Courtesy Associates, Inc. Proc. of the DOE Thermal and Chem. Storage Ann. Contractor's Rev. Meeting Mar. 1981 p 1-2 (For primary document see N82-24652 15-44)
Avail: NTIS HC A16/MF A01

The program promotes energy savings and fuel substitution by developing and helping to commercialize technologies for storing heat or cold, with shot investment payback periods as a cost goal. The sources of energy include industrial and utility waste heat as well as primary sources such as solar, geothermal, nuclear and fossil fuels. The primary source of 'cold' for seasonal storage is winter chilled air. The program emphasizes near-term (1980's) approaches to energy conservation and displacement of natural gas and oil. It also provides for development of technologies which will allow use of renewable resources such as solar-thermal energy during the mid-term (1990's) and advanced energy storage and transport techniques for the far-term (beyond 2000). T.M.

N82-24654# Oak Ridge National Lab., Tenn.
ORNL THERMAL ENERGY STORAGE PROGRAM OVERVIEW
J. F. Martin *In* Courtesy Associates, Inc. Proc. of the DOE Thermal and Chem. Storage Ann. Contractor's Rev. Meeting Mar. 1981 p 3-10 refs (For primary document see N82-24652 15-44)
Avail: NTIS HC A16/MF A01

Development of thermal energy storage (TES) technologies and subsystems is relevant to national energy objectives in energy conservation and in the deployment of new energy souces. Oak Ridge National Laboratory (ORNL) acts as a Lead Technical Laboratory in managing for DOE-STOR those elements of the program dealing with building heating and cooling, and industrial applications. The scope of ORNL activity in these two activities is described, and a summary of each of the in-house and

subcontracted projects current or anticipated for the next fiscal year are presented. The major thrust of each of the elements of the ORNL program is given. Author

N82-24655# New York State Energy Research and Development Authority, Albany.
DESIGN AND DEMONSTRATION OF A STORAGE-ASSISTED AIR CONDITIONING SYSTEM
Joseph E. Rizzuto *In* Courtesy Associates, Inc. Proc. of the DOE Thermal and Chem. Storage Ann. Contractor's Rev. Meeting Mar. 1981 p 11-14 (For primary document see N82-24652 15-44)
Avail: NTIS HC A16/MF A01

The system is a peak-shaving system designed to provide a levelized air conditioning load. The system also requires minimum air conditioner and thermal storage capacity. The storage-assisted air conditioning system uses a Glauber's salt-based phase change material in sausage like containers called CHUBS. The CHUBS are two (2) inches in diameter and 20 inches long. They are stacked in modules of 64 CHUBS which are appropriately spaced and oriented in the storage system so that air may pass perpendicular to the long axis of the CHUBS. The phase change material, has a thermal storage capacity in the range of 45 to 50 Btu/lb and a transition temperature of approximately 55 F. T.M.

N82-24656# Argonne National Lab., Ill.
EXPERIMENTAL EVALUATION OF THERMAL ENERGY STORAGE Status Report
H. N. Hersh *In* Courtesy Associates, Inc. Proc. of the DOE Thermal and Chem. Storage Ann. Contractor's Rev. Meeting Mar. 1981 p 15-17 (For primary document see N82-24652 15-44)
Avail: NTIS HC A16/MF A01

Thermal energy storage (TES) for space heating is a load management technique that is successfully used in Europe. Results from the ANL assessment of energy storage technologies indicated that customer owned TES units of the type used in Europe could provide a cost-effective means for utility load management in the U.S. It is only necessary, therefore, that the technical and economic viability of this technology be examined under the U.S. climatic, institutional and other conditions. T.M.

N82-24657# Dayton Univ., Ohio.
DEVELOPMENT OF AN OPTIMUM PROCESS FOR ELECTRON BEAM CROSSLINKING OF HIGH DENSITY POLYETHYLENE PELLETS
Ival O. Salyer and Joseph E. Davison *In* Courtesy Associates, Inc. Proc. of the DOE Thermal and Chem. Storage Ann. Contractor's Rev. Meeting Mar. 1982 p 18-21 Sponsored by ORNL (For primary document see N82-24652 15-44)
Avail: NTIS HC A16/MF A01

Commercially available high density polyethylene pellets were irradiated to total doses of 2, 4, 6, and 8 megarads in a single pass through an electron beam. Radiation doses of five to six megarads are sufficient to maintain the thermal form stability of high density polyethylene pellets. The enthalpy of fusion at these radiation doses is approximately 90 percent of the value of the unirradiated pellets. The melting temperature of the pellets does not change with the radiation dosage, and the pellets may be successfully irradiated in air. The irradiated pellets were thermally cycled through their melting point for more than 100 complete cycles and maintained an open structure that is porous to the flow of the heat transfer fluid. T.M.

N82-24658# Oak Ridge National Lab., Tenn.
THERMAL ENERGY STORAGE TEST FACILITY
Mark P. Ternes *In* Courtesy Associates, Inc. Proc. of the DOE Thermal and Chem. Storage Ann. Contractor's Rev. Meeting Mar. 1981 p 22-23 (For primary document see N82-24652 15-44) (Contract W-7405-eng-26)
Avail: NTIS HC A16/MF A01

Two loops making up the facility, using either air or liquid as the thermal transport fluid, are described. These loops will be capable of cycling residential-size thermal energy storage units through conditions simulating solar or off-peak electricity applications to evaluate the unit's performance. Construction of the liquid cycling loop was completed, and testing of thermal stratification techniques for hot and cold water is reported. T.M.

N82-24659# Oak Ridge National Lab., Tenn.
CRAWL SPACE-ASSISTED HEAT PUMP
Mark P. Ternes *In* Courtesy Associates, Inc. Proc. of the DOE Thermal and Chem. Storage Ann. Contractor's Rev. Meeting Mar. 1981 p 24-26 (For primary document see N82-24652 15-44) (Contract W-7405-eng-26)
Avail: NTIS HC A16/MF A01

A variety of experiments and simulations were performed to determine the feasibility of conditioning the source air of an air-to-air heat pump using stored ground heat or cooled to produce higher seasonal COP's and net energy savings. Winter data show that significant preheating occurs consistently for both the single-pass and total-recycle mode, with the latter showing the better results between the two. Preliminary summer data shows that precooling does occur, but that the heat pump system should be operated in the single-pass mode only. Comparison between experiments led to the conclusion that the preconditioning is due mostly to the stored earth heat or cool and is not due in any great part to heat exchange with the house. T.M.

N82-24660# Union Carbide Corp., Oak Ridge, Tenn.
MATHEMATICAL MODELING OF MOVING BOUNDARY PROBLEMS IN THERMAL ENERGY STORAGE
A. D. Solomon *In* Courtesy Associates, Inc. Proc. of the DOE Thermal and Chem. Storage Ann. Contractor's Rev. Meeting Mar. 1981 p 28-30 refs (For primary document see N82-24652 15-44)
Avail: NTIS HC A16/MF A01

Results of an analytical nature, including the development of approximations which allow the behavior of systems to be predicted, are presented. The simulation, development, and validation via comparisons with experiments, exact solutions to model problems, and other methods, are discussed. The numerical analysis problems that arise from the simulation development are summarized. T.M.

N82-24661# Argonne National Lab., Ill.
DISTRIBUTED THERMAL ENERGY STORAGE IN THE RESIDENTIAL SECTOR: COMMERCIALIZATION READINESS ASSESSMENT AND IMPLEMENTATION STRATEGY
R. F. Giese *In* Courtesy Associates, Inc. Proc. of the DOE Thermal and Chem. Storage Ann. Contractor's Rev. Meeting Mar. 1981 p 31-32 (For primary document see N82-24652 15-44)
Avail: NTIS HC A16/MF A01

Significant national benefits can result from the use of customer-sides-of-the-meter thermal energy storage (TES). It appears that TES for residential space heating and hot water heating can capture a market large enough to yield annual oil savings of approximately 80 million barrels (0.3 quads) by the year 2000. The readiness of each of three candidate TES systems for near-term commercialization was examined. It was concluded that of these, TES for residential space and hot water heating are technically and economically ready for commercialization. T.M.

N82-24662# Purdue Univ., Lafayette, Ind. School of Mechanical Engineering.
THERMAL ENERGY STORAGE TESTING FACILITY
R. J. Schoenhals, C. P. Lin, H. F. Kuehlert, and S. H. Anderson *In* Courtesy Associates, Inc. Proc. of the DOE Thermal and Chem. Storage Ann. Contractor's Rev. Meeting Mar. 1981 p 33-36 refs (For primary document see N82-24652 15-44) (Contract W-31-109-38-4666)
Avail: NTIS HC A16/MF A01

Development of a prototype testing facility for performance evaluation of electrically heated thermal energy storage units is described. Laboratory apparatus and test procedures were evaluated by means of measurements and analysis. A 30kW central unit and several smaller individual room-size units were tested. T.M.

N82-24663# Franklin Research Center, Philadelphia, Pa.
SURVEY OF THERMAL STORAGE INSTALLATIONS IN THE UNITED STATES AND CANADA
Harold G. Lorsch *In* Courtesy Associates, Inc. Proc. of the DOE Thermal and Chem. Storage Ann. Contractor's Rev. Meeting Mar. 1981 p 37-38 refs (For primary document see N82-24652 15-44)

Avail: NTIS HC A16/MF A01

A document was published that lists all of the operational thermal storage systems in North America and demonstrates that thermal storage has a long and diversified history of successful application. This, overcomes some of the hesitation of engineers to design such systems. S.L.

N82-24664# North Carolina State Univ., Raleigh. Engineering Research Services Div.

OLIVINE-BASED HEAT STORAGE REFRACTORIES

Billy M. Gay, Hayne Palmour, III, and Ronald L. Cochrane *In* Courtesy Associates, Inc. Proc. of the DOE Thermal and Chem. Storage Ann. Contractor's Rev. Meeting Mar. 1981 p 39-43 refs (For primary document see N82-24652 15-44)

Avail: NTIS HC A16/MF A01

The processing properties and performance of special refractory shapes produced from olivine for prototype evaluations in heat storage furnaces are investigated. Heat storage furnaces and related consumer owned thermal storage units are energy conversion/storage devices of the sensible heat type. Their primary purpose is to permit electrical load leveling of large generating/distributing systems. Load-leveling enables power generating plants to operate more efficiency thus contributing to better overall energy utilization. The principal application for these ceramic thermal energy reservoirs is in home or business heating (furnaces, space heaters). S.L.

N82-24665# Tennessee Univ., Knoxville. Dept. of Mechanical and Aerospace Engineering.

PERFORMANCE OF STRATIFIED THERMAL STORAGE SYSTEM FOR OLIVER SPRINGS ELEMENTARY SCHOOL

Progress Report

R. L. Reid and A. F. G. Bedinger *In* Courtesy Associates, Inc. Proc. of the DOE Thermal and Chem. Storage Ann. Contractor's Rev. Meeting Mar. 1981 p 44-46 ref (For primary document see N82-24652 15-44)

Avail: NTIS HC A16/MF A01

A progress report on the performance of a stratified thermal storage system coupled with a heat recovery refrigeration machine designed to provide space heating, cooling, and service water heating is presented. Water storage tanks utilizing a flexible membrane to resist temperature blending will be used as the thermal storage element. The two design goals of the heat recovery and thermal energy storage system are: (1) to minimize the need to purchase energy for space heating and cooling and water heating, and (2) to minimize electrical demand. An automatic data acquisition system will be used for system performance data gathering. M.D.K.

N82-24666# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.

AN OVERVIEW OF THE SERI SOLAR ENERGY STORAGE PROGRAM

Charles E. Wyman *In* Courtesy Associates, Inc. Proc. of the DOE Thermal and Chem. Storage Ann. Contractor's Rev. Meeting Mar. 1981 p 47-49 refs (For primary document see N82-24652 15-44)

Avail: NTIS HC A16/MF A01

Thermal energy storage concepts and thermal energy transport by sensible and latent heat media are studied. Systems analyses are performed of thermal energy storage for solar thermal applications, and surveys and assessments are used to coordinate thermal energy storage activities for solar applications, particularly in building heating and cooling. S.L.

N82-24667# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.

DIRECT CONTACT HEAT TRANSFER FOR THERMAL ENERGY STORAGE

John D. Wright *In* Courtesy Associates, Inc. Proc. of the DOE Thermal and Chem. Storage Ann. Contractor's Rev. Meeting Mar. 1982 p 50-53 refs (For primary document see N82-24652 15-44)

Avail: NTIS HC A16/MF A01

Direct contact heat exchange offers the potential for increased efficiency and lower heat transfer costs in a variety of thermal energy storage systems. SERI models of direct contact heat transfer based on literature information identified dispersed phase drop size, the mechanism of heat transfer within the drop, and dispersed phase holdup as the parameters controlling direct contact system performance. Tests were defined and equipment constructed to provide independent determination of drop size, heat transfer mechanism, and hold up. Further experiments are needed to conclusively determine whether the salt in a salt hydrate melt acts to block internal circulation. The potential of low temperature oil/salt hydrate latent heat storage systems is being evaluated in the laboratory. M.D.K.

N82-24668# Midwest Research Inst., Golden, Colo. Solar Energy Research Inst.

SYSTEMS ANALYSIS OF THERMAL STORAGE

R. J. Copeland *In* Courtesy Associates, Inc. Proc. of the DOE Thermal and Chem. Storage Ann. Contractor's Rev. Meeting Mar. 1981 p 54-57 refs (For primary document see N82-24652 15-44)

Avail: NTIS HC A16/MF A01

During FY80 analyses were conducted on thermal storage concepts for solar thermal applications. These studies include both estimates of the obtainable costs of thermal storage concepts and their worth to a user (i.e., value). Based on obtainable costs and performance, promising thermal storage concepts are being identified. A preliminary screening was completed in FY80 and a more in-depth study was initiated. Value studies are being conducted to establish cost goals. A ranking of storage concepts based on value in solar thermal electric plants was conducted for both diurnal and long duration applications. Ground mounted thermal storage concepts for a parabolic dish/Stirling system are also being evaluated. Author

N82-24669# Stearns-Roger Corp., Denver, Colo.

COST AND PERFORMANCE OF THERMAL STORAGE CONCEPTS IN SOLAR THERMAL SYSTEMS

A. W. McKenzie *In* Courtesy Associates, Inc. Proc. of the DOE Thermal and Chem. Storage Ann. Contractor's Rev. Meeting Mar. 1981 p 58-59 (For primary document see N82-24652 15-44)

Avail: NTIS HC A16/MF A01

Studies to provide consistently calculated cost data, develop realistic performance data, and to project data for several thermal storage concepts integrated into several solar thermal systems are summarized. Available thermal storage concepts were reviewed through a literature search, contacts, and contractors. A screening criteria was developed and schematics were made for these systems. Rough-order-of-magnitude costs were determined and candidate systems were further reduced. The remaining twenty systems were more fully developed. M.D.K.

N82-24670# Institute of Gas Technology, Chicago, Ill.

HIGH-TEMPERATURE MOLTEN SALT THERMAL ENERGY STORAGE SYSTEMS FOR SOLAR APPLICATIONS

R. J. Petri and T. D. Claar *In* Courtesy Associates, Inc. Proc. of the DOE Thermal and Chem. Storage Ann. Contractor's Rev. Meeting Mar. 1982 p 60-64 refs (For primary document see N82-24652 15-44)

Avail: NTIS HC A16/MF A01

A plan for the selection and testing of latent-heat alkali and alkaline earth carbonate storage salts, containment materials, and thermal conductivity enhancement (TCE) materials for use in high-temperature (704 to 871 C) thermal energy storage systems utilizing advanced solar-thermal power generation concepts is described. Screening of candidate salt/containment/TCE materials combinations will be performed. Results of these compatibility tests will lead to the selection of materials combinations that meet anticipated solar power system requirements. Needs for more reliable thermophysical and transport property data will be identified and measurements will then be performed on these salts to support the scale-up of solar-thermal TES subsystems. M.D.K.

N82-24671# Grumman Aerospace Corp., Bethpage, N.Y.

ACTIVE HEAT EXCHANGE: SYSTEM DEVELOPMENT FOR LATENT HEAT THERMAL ENERGY STORAGE

J. Alario and R. Haslett *In* Courtesy Associates, Inc. Proc. of the DOE Thermal and Chem. Storage Ann. Contractor's Rev. Meeting Mar. 1981 p 65-67 (For primary document see N82-24652 15-44)

Avail: NTIS HC A16/MF A01

An active heat exchange method in a latent heat (salt) thermal energy storage system that prevents a low conductivity solid salt layer from forming on heat transfer surfaces was developed. An evaluation of suitable media with melting points in the temperature range of interest (250 to 400 C) limited the candidates to molten salts from the chloride, hydroxide, and nitrate families, based on high storage capacity, good corrosion characteristics, and availability in large quantities at reasonable cost. The specific salt recommended for laboratory tests was a choride eutectic (20.5KCl, 24.5NaCl, 55.0MgCl2 percent by wt.), with a nominal melting point of 385 C. Author

N82-24672# Naval Research Lab., Washington, D. C.
THE 1980 REPORT ON NRL ENERGY STORAGE PROGRAM
T. A. Chubb, J. J. Nemecek, D. E. Simmons, and R. J. Veith *In* Courtesy Associates, Inc. Proc. of the DOE Thermal and Chem. Storage Ann. Contractor's Rev. Meeting Mar. 1981 p 68-72 (For primary document see N82-24652 15-44)
Avail: NTIS HC A16/MF A01

The development of a means for bulk storage of energy in a form capable of providing demand sensitive steam, heat, or cooling is described. Salt eutectic systems availability and costs of salts, progress on the 2 MWht energy storage boiler tank under construction at NRL, and major elements of storage system costs for this 2 MWht tank which employs a heat transfer fluid are discussed. A radiation coupled energy storage tank concept is also discussed. Author

N82-24673# Delaware Univ., Newark.
HEAT STORAGE IN ALLOY TRANSFORMATIONS
C. Ernest Birchenall *In* Courtesy Associates, Inc. Proc. of the DOE Thermal and Chem. Storage Ann. Contractor's Rev. Meeting Mar. 1981 p 73-78 (For primary document see N82-24652 15-44)
Avail: NTIS HC A16/MF A01

Heat storage was approached in the following four directions: (1) calorimetric measurements of heats of eutectic transformation and heat capacities of solid and liquid mixtures to determine the maximum heat storage capability; (2) volume changes during transformation and thermal expansion below, and above the transformation temperature as measured by X-ray absorption; (3) the use of graphite and carbides, successful bulk containers, as coatings to protect steels against attack by the heat storage alloys; and (4) heat flow models for simple heat exchanger geometries to show the advantage of alloys over salts for fast storage. M.D.K.

N82-24674# TRW, Inc., Oak Ridge, Tenn.
THERMAL ENERGY STORAGE FOR RESIDENTIAL ENERGY CONSERVATION
David Goldenberg *In* Courtesy Associates, Inc. Proc. of the DOE Thermal and Chem. Storage Ann. Contractor's Rev. Meeting Mar. 1981 p 79-83 refs (For primary document see N82-24652 15-44)
Avail: NTIS HC A16/MF A01

The potential for conservation of oil and gas was evaluated for thermal energy storage applications involving waste heat recovery and passive solar systems for houses that have gas- or oil-fired furnaces. A waste heat recovery device using pebbles as the TES medium increases furnace seasonal efficiency to 95%. Passive solar system performance was estimated from work sponsored by the Department of Energy. Potential market sizes and penetrations were evaluated by region to determine national oil and gas savings. The total oil and gas savings for the year 2000 were estimated to be 0.22 quads/year for the furnace waste heat recovery device and 0.10 quads/year for passive solar systems installed in houses heated by gas or oil furnaces. Author

N82-24675# Sandia Labs., Livermore, Calif.
SOLAR THERMAL POWER STORAGE APPLICATIONS LEAD LABORATORY OVERVIEW
Lee G. Radosevich *In* Courtesy Associates, Inc. Proc. of the DOE Thermal and Chem. Storage Ann. Contractor's Rev. Meeting Mar. 1981 p 84-88 Sponsored by DOE (For primary document see N82-24652 15-44)
Avail: NTIS HC A16/MF A01

An overview of activties for the applications elements of the Thermal Energy Storage for Solar Thermal Applications (TESSTA) program is presented. The TESSTA program which was initiated in FY80 is organized through a work breakdown structure which includes the development of thermal storage technologies matched to solar thermal power system requirements for several near-term applications. The status of the technology development activities ongoing in FY80 is presented here along with plans for FY81. Author

N82-24676# Sandia Labs., Livermore, Calif.
MOLTEN NITRATE SALT MATERIALS STUDIES
Robert M. Carling *In* Courtesy Associates, Inc. Proc. of the DOE Thermal and Chem. Storage Ann. Contractor's Rev. Meeting Mar. 1981 p 89-94 Sponsored by DOE (For primary document see N82-24652 15-44)
Avail: NTIS HC A16/MF A01

An overview of the experimental programs underway in support of the Thermal Energy Storage for Solar Thermal Applications (TESSTA) program is presented. The experimental programs are concentrating on molten nitrate salts which were proposed as heat transfer and energy storage medium. The experimental programs involve corrosion, decomposition, physical properties, and environmental cracking. Summaries of each project and how they impact central receiver applications are presented. Author

N82-24677# EIC, Inc., Newton, Mass.
MOLTEN NITRATE SALT CHEMISTRY STUDIES
S. H. White, U. M. Twardoch, and M. M. Bower *In* Courtesy Associates, Inc. Proc. of the DOE Thermal and Chem. Storage Ann. Contractor's Rev. Meeting Mar. 1981 p 95-98 refs (For primary document see N82-24652 15-44)
Avail: NTIS HC A16/MF A01

The interaction of water and carbon dioxide in air with molten alkali nitrates in the temperature range 300 - 600 C was determined and quantified. Electroanalytical methods involving voltammetry, chronopotentiometry and chronoamperometry at both rotating and stationary electrodes were established to investigate molten nitrate chemistry. Results show that water is reversibly removed from the melt up to 350 C. Fast scan cyclic voltammetry and high current density chronopotentiometry will be necessary to avoid disturbances of the diffusion layer at high solute concentrations to enable the electroanalysis to be rigorous. M.D.K.

N82-24678# Oak Ridge National Lab., Tenn.
MASS-TRANSFER CHARACTERISTICS OF NITRATE-BASED SALT MIXTURES
J. H. DeVan and P. F. Tortorelli *In* Courtesy Associates, Inc. Proc. of the DOE Thermal and Chem. Storage Ann. Contractor's Rev. Meeting Mar. 1981 p 99-101 refs Sponsored in part by DOE (For primary document see N82-24652 15-44)
(Contract W-7405-eng-26)
Avail: NTIS HC A16/MF A01

Molten eutectic NaNO3-KNO3 was being circulated in three thermal convection loops constructed of alloy 800 and types 304L and 316 stainless steel. The loops were operated at a maximum salt temperature of 595 C and a salt temperature differential of 235 C. Corrosion specimens contained within each loop were withdrawn for periodic determinations of weight and microstructural changes. Salt samples were analyzed at selected intervals to monitor changes in the composition of the salt. Controlled potential voltammetry was also used. Results indicate low corrosion rates for the austenitic stainless steels in flowing NaNO3-KNO3. M.D.K.

N82-24679# State Univ. of New York at Buffalo. Dept. of Chemistry.
CORROSION BEHAVIOR OF ALLOYS
Robert A. Osteryoung and Hector Fernandez *In* Courtesy Associates, Inc. Proc. of the DOE Thermal and Chem. Storage Ann. Contractor's Rev. Meeting Mar. 1981 p 102-103 refs (For primary document see N82-24652 15-44)
Avail: NTIS HC A16/MF A01

Studies of molten nitrates at temperatures in the 450 - 550 C range were made to obtain information which will

ultimately permit an understanding of the corrosion behavior of structural alloys, such as Incoloy 800, that will be employed in thermal loops in solar power systems. Initial activity will involve studies of species expected to exist in these melts from corrosion of structural alloys, i.e., iron, nickel and chromium.
Author

N82-24680# Sandia Labs., Albuquerque, N. Mex. Fluid Mechanics and Heat Transfer Div.
STATUS REPORT OF THERMOCLINE THERMAL ENERGY STORAGE STUDIES AT SANDIA NATIONAL LABORATORIES
Robert J. Gross and Raymond W. Harrigan *In* Courtesy Associates, Inc. Proc. of the DOE Thermal and Chem. Storage Ann. Contractor's Rev. Meeting Mar. 1981 p 104-108 refs (For primary document see N82-24652 15-44)
Avail: NTIS HC A16/MF A01

The thermocline thermal energy storage concept was evaluated to fulfill the needs of solar thermal energy systems. A 1200 gallon engineering prototype tank was constructed and tested. Component development and computer code verification were initiated. Analytical modeling, both one and two-dimensional was also initiated. The feasibility of thermocline storage and the maximum expected performance, in both an engineering and economic sense, are to be determined. M.D.K.

N82-24681# California Univ., Berkeley. Dept. of Mechanical Engineering.
EXPERIMENTAL AND THEORETICAL STUDY OF THERMOCLINE DEGRADATION
S. Chaney, N. Hayden, and J. A. C. Humphrey *In* Courtesy Associates, Inc. Proc. of the DOE Thermal and Chem. Storage Ann. Contractor's Rev. Meeting Mar. 1981 p 109-112 refs Sponsored by DOE (For primary document see N82-24652 15-44)
Avail: NTIS HC A16/MF A01

A brief review is given a research program investigating the basic fluid mechanics and heat transfer aspects of thermocline behavior in energy storage systems. The research consists of a three pronged effort. Theoretical and numerical analyses are developed, the results of which are to be compared with a laboratory-scale experiment. The experiment and theoretical approaches are described. The present status of the research program is outlined and anticipated accomplishments demarcated. Author

N82-24682*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
DISH-MOUNTED LATENT HEAT BUFFER STORAGE
Ram Manvi *In* Courtesy Associates, Inc. Proc. of the DOE Thermal and Chem. Storage Ann. Contractor's Rev. Meeting Mar. 1981 p 113-117 (For primary document see N82-24652 15-44)
Avail: NTIS HC A16/MF A01

Dish-mounted latent heat storage subsystems for Rankine, Brayton, and Stirling engines operating at 427 C, 816 C, and 816 C respectively are discussed. Storage requirements definition, conceptual design, media stability and compatibility tests, and thermal performance analyses are considered. Author

N82-24683# General Electric Co., Evendale, Ohio.
STORAGE REQUIREMENTS DEFINITION AND SRE DESIGN FOR DISH STIRLING SYSTEMS
W. F. Zimmerman, L. E. Stacy, and G. C. Wesling *In* Courtesy Associates, Inc. Proc. of the DOE Thermal and Chem. Storage Ann. Contractor's Rev. Meeting Mar. 1981 p 118-122 (For primary document see N82-24652 15-44)
Avail: NTIS HC A16/MF A01

A direct dish Stirling solar receiver (DSSR) and a heat pipe solar receiver with TES (HPSR) are described. Cost effectiveness and thermal performance, analyzed minute by minute over one year of solar insolation are included. Using existing designs of these two receivers, parametric performance and cost studies to determine the influences of adding varying amounts of TES to the DSSR, and of providing fossil fuel combustion, and of varying the levels of TES in the HPSR are discussed. The thermal modeling of the two receivers was completed and the criteria and programming for the economic analysis were documented.
Author

N82-24684# Ford Aerospace and Communications Corp., Newport Beach, Calif. Aeronutronic Div.
THERMAL ENERGY BUFFER STORAGE FOR THE SMALL COMMUNITY SOLAR THERMAL POWER EXPERIMENT
R. E. Polzien *In* Courtesy Associates, Inc. Proc. of the DOE Thermal and Chem. Storage Ann. Contractor's Rev. Meeting Mar. 1981 p 123-128 refs (For primary document see N82-24652 15-44)
Avail: NTIS HC A16/MF A01

The application of a latent heat thermal energy buffer storage (TEBS) subsystem to the small community solar thermal power experiment (SCSE) is discussed. The SCSE consists of multiple point focusing distributed receiver (PFDR) power modules equipped with an organic Rankine cycle power conversion unit mounted at the focus of each paraboloidal concentrator. The objective of the TEBS is to minimize plant shutdowns during intermittent cloud coverages, thereby improving life expectancy of the major subsystems with attendant reduction in capital investment and maintenance costs. An SCSE plant performance model modified for operation with a TEBS system is used with time varying insolation to show that 70 to 80 percent of the potential engine shutdowns due to insolation dropout may be averted with the TEBS system. Results of preliminary design analyses of various TEBS concepts are discussed. Author

N82-24685# Rocket Research Corp., Redmond, Wash.
APPLICATION OF THERMAL ENERGY STORAGE TO PROCESS HEAT RECOVERY IN THE ALUMINUM INDUSTRY
Lincoln B. Katter *In* Courtesy Associates, Inc. Proc. of the DOE Thermal and Chem. Storage Ann. Contractor's Rev. Meeting Mar. 1981 p 129-132 (For primary document see N82-24652 15-44)
Avail: NTIS HC A16/MF A01

The economic viability and institutional compatibility of a district heating system that uses waste heat from an aluminum plant as the source of thermal energy are discussed. The project was designed to show how existing energy storage techniques can enhance the utility of low temperature waste heat streams.
Author

N82-24686*# Edde (Howard), Inc., Bellevue, Wash.
COLLECTION AND DISSEMINATION OF THERMAL ENERGY STORAGE SYSTEM INFORMATION FOR THE PULP AND PAPER INDUSTRY
Howard Edde *In* Courtesy Associates, Inc. Proc. of the DOE Thermal and Chem. Storage Ann. Contractor's Rev. Meeting Mar. 1981 p 133-136 refs (For primary document see N82-24652 15-44)
(Contract DEN3-190)
Avail: NTIS HC A16/MF A01 CSCL 10A

The collection and dissemination of thermal energy storage (TES) system technology for the pulp and paper industry with the intent of reducing fossil fuel usage is discussed. The study plan is described and a description presented of example TES systems. Author

N82-24687# Heinz (H. J.) Co., Pittsburgh, Pa.
APPLICATIONS OF THERMAL ENERGY STORAGE TO WASTE HEAT RECOVERY IN THE FOOD PROCESSING INDUSTRY
G. J. Trebilcox and W. L. Lundberg (Westinghouse Electric Corp., Pittsburgh, Pa.) *In* Courtesy Associates, Inc. Proc. of the DOE Thermal and Chem. Storage Ann. Contractor's Rev. Meeting Mar. 1981 p 137 (For primary document see N82-24652 15-44)
(Contract EC-77-C-01-5002)
Avail: NTIS HC A16/MF A01

The canning segment of the food processing industry is a major energy user within that industry. Most of its energy demand is met by hot water and steam and those fluids, in addition to product cooling water, eventually flow from the processes as warm waste water. To minimize the possibility of product contamination, a large percentage of that waste water is sent directly to factory drains and sewer systems without being recycled and in many cases the thermal energy contained by the waste streams also goes unreclaimed and is lost from further use. Waste heat recovery in canning facilities can be performed economically using systems that employ thermal energy storage

(TES). A project was proposed in which a demonstration waste heat recovery system, including a TES feature, would be designed, installed and operated. Author

N82-24688# Burns and Roe, Inc., Oradell, N. J.
ONCE-THROUGH HEAT SUPPLY SYSTEM FOR CITY OF BELLINGHAM
I. Oliker *In* Courtesy Associates, Inc. Proc. of the DOE Thermal and Chem. Storage Ann. Contractor's Rev. Meeting Mar. 1981 p 138-140 refs (For primary document see N82-24652 15-44)
Avail: NTIS HC A16/MF A01

Technical aspects of a once-through system are discussed. Waste heat utilization, space heating, and heat storage, are discussed. N.W.

N82-24689*# Department of Energy, Washington, D. C.
OVERVIEW OF THE CHEMICAL/HYDROGEN ENERGY SYSTEMS (C/HES) PROGRAM
Fred Gornick *In* Courtesy Associates, Inc. Proc. of the DOE Thermal and Chem. Storage Ann. Contractor's Rev. Meeting Mar. 1981 p 141-144 Sponsored in part by JPL, Brookhaven National Lab. and DOE (For primary document see N82-24652 15-44)
Avail: NTIS HC A16/MF A01 CSCL 10A

The production, storage and transmission, and utilization of hydrogen are included. Management structure and the programmatic emphasis are summarized. Author

N82-24690*# Department of Energy, Washington, D. C.
CHEMICAL/HYDROGEN ENERGY STORAGE SYSTEMS
Douglas S. Miller and Al Mezzina *In* Courtesy Associates, Inc. Proc. of the DOE Thermal and Chem. Storage Ann. Contractor's Rev. Meeting Mar. 1981 p 145-149 Sponsored in part by JPL and Brookhaven National Lab. (For primary document see N82-24652 15-44)
Avail: NTIS HC A16/MF A01 CSCL 10A

Electrochemical and thermochemical systems are reviewed. Chemical heat pumps, end-use applications and systems studies, and storage systems and materials are also discussed. N.W.

N82-24691# Rocket Research Corp., Redmond, Wash.
THE SULFURIC ACID/WATER CHEMICAL HEAT PUMP/ENERGY STORAGE PROGRAM
E. C. Clark, D. K. Carlson, and O. M. Morgan *In* Courtesy Associates, Inc. Proc. of the DOE Thermal and Chem. Storage Ann. Contractor's Rev. Meeting Mar. 1981 p 150-153 refs (For primary document see N82-24652 15-44)
Avail: NTIS HC A16/MF A01

A large-scale verification test unit was designed which incorporates many commercial mass producible design features and materials. The nominal storage capacity is 1,000,000 Btu, with a power rating equal to 150,000 Btu/hr. An engineering model CHP/CES system was designed, fabricated, and tested closed loop with a nominal 25,000 Btu/hr charge and discharge rate and 150K to 300K Btu storage capacity, depending on the number of tanks. Preliminary testing of commercial grade acid plumbing and valves is complete with no equipment failures. Author

N82-24692# EIC, Inc., Newton, Mass.
A CHEMICAL HEAT PUMP BASED ON THE REACTION OF CALCIUM CHLORIDE AND METHANOL FOR SOLAR HEATING, COOLING AND STORAGE
P. OD. Offenhartz *In* Courtesy Associates, Inc. Proc. of the DOE Thermal and Chem. Storage Ann. Contractor's Rev. Meeting Mar. 1981 p 154-158 Sponsored by DOE. Prepared in cooperation with Sandia Lab., Livermore, Calif. and Brookhaven National Lab., Upton, N.Y. (For primary document see N82-24652 15-44)
Avail: NTIS HC A16/MF A01

An engineering development test prototype of the CaCl2-CheOH chemical heat pump was tested. The unit, which has storage capacity in excess of 100,000 BTU, completed over 100 full charge-discharge cycles. Cycling data show that the rate of heat pumping depends strongly on the absorber-evaporator temperature difference. These rates are more than adequate for solar heating or for solar cooling using dry ambient air heat rejection. Performance degradation after 100 cycles, expressed as a contact resistance, was less than 2 C. The heat exchangers showed some warpage due to plastic flow of the salt, producing the contact resistance. The experimental COP for cooling was 0.52, close to the theoretically predicted value. Author

N82-24693# TRW, Inc., McLean, Va. Energy Systems Planning Div.
A COST-EFFECTIVENESS EVALUATION OF CHEMICAL HEAT PUMPS
W. R. Standley, R. Gorman, P. S. Moritz, and T. J. OGorman *In* Courtesy Associates, Inc. Proc. of the DOE Thermal and Chem. Storage Ann. Contractor's Rev. Meeting Mar. 1981 p 159-162 (For primary document see N82-24652 15-44)
Avail: NTIS HC A16/MF A01

Chemical heat pump technologies are compared with a baseline of existing HVAC technologies and a set of emerging competitive technologies. The basis for comparison is system cost effectiveness in one or more specific applications, with levelized annual cost taken as the measure of cost effectiveness. The specific applications are a residential building and a commercial building, each requiring HVAC services. An industrial process-heat upgrading application is also included. For each system, the net consumption of fossil fuel resources is evaluated, and environmental/safety aspects identified. Author

N82-24694# Argonne National Lab., Ill.
DESIGN AND PERFORMANCE OF A MULTITUBE METAL-HYDRIDE HEAT PUMP
J. M. Clinch, H. Abelson, and J. S. Horowitz *In* Courtesy Associates, Inc. Proc. of the DOE Thermal and Chem. Storage Ann. Contractor's Rev. Meeting Mar. 1981 p 163-166 refs (For primary document see N82-24652 15-44)
Avail: NTIS HC A16/MF A01

The design of a unique multitube metal hydride heat pump that can be cycled rapidly is described, and its performance is analyzed. Each tube contains a high-temperature hydride at one end and a low-temperature hydride at the other end. The design features a large number (above 200) of individual tubes and includes external thermal regeneration loops to reduce the performance losses inherent in thermal cycling. The entire heat-pump cycle is modelled and one typical result of a complete simulation of the regenerative heat-exchange process is included. A calculation is performed to predict the coefficient of performance (COP) in the heating mode for a given turbular design. Author

N82-24695# MPD Technology Corp., Wyckoff, N.J. Ergenics Div.
HYDRIDE CHEMICAL COMPRESSOR, PHASE 1
P. P. Turillon, F. E. Lynch (Hydrogen Consultants, Inc.), and R. A. Nye (Denver Research Inst.) *In* Courtesy Associates, Inc. Proc. of the DOE Thermal and Chem. Storage Ann. Contractor's Rev. Meeting Mar. 1981 p 167-169 refs (For primary document see N82-24652 15-44)
Avail: NTIS HC A16/MF A01

A proof-of-concept bench-size hydride compressor was successfully built and tested. In continuous operation this unit delivered 20.3 liters/min (43SCFH) at a pressure of 42.2 atmospheres (650 Psia). The efficiency however was lower than anticipated. The operation of this small unit revealed several important factors which influence the overall efficiency of such a hydride hydrogen compressor. The reduced efficiency of the bench scale unit was caused by mechanical design details (such as excessive amount of copper due to the electrical heating system) as well as problems with the hydriding alloy (reduced capacity at elevated temperatures and decrease in plateau pressure after 700 cycles of operation). Author

N82-24696# MPD Technology Corp., Wyckoff, N.J. Ergenics Div.
DEVELOPMENT STATUS OF A METAL HYDRIDE PROCESS FOR HYDROGEN RECOVERY
E. L. Huston *In* Courtesy Associates, Inc. Proc. of the DOE Thermal and Chem. Storage Ann. Contractor's Rev. Meeting Mar. 1981 p 170-171 refs (For primary document see N82-24652 15-44)
Avail: NTIS HC A16/MF A01

A new project seeking to develop and demonstrate a commercial metal hydride process for hydrogen recovery was

initiated. The status of hydride separation technology is reviewed and the project milestones are summarized. Author

N82-24697# General Electric Co., Wilmington, Mass.
DEVELOPMENT STATUS OF SOLID POLYMER ELECTROLYTE WATER ELECTROLYSIS FOR LARGE SCALE HYDROGEN GENERATION
J. H. Russell *In* Courtesy Associates, Inc. Proc. of the DOE Thermal and Chem. Storage Ann. Contractor's Rev. Meeting Mar. 1981 p 172-174 refs (For primary document see N82-24652 15-44)
Avail: NTIS HC A16/MF A01

Solid polymer water electrolysis technology for large scale hydrogen generation is reviewed. A hydrogen generator module, capable of producing 2000 SCFH, was operated successfully for over 700 hours in the 200 kW system. Test results and further information are presented. Technology development was continued in support of improving both capital cost and conversion efficiency. Progress made in the development of the 10 sq ft active area cell included completion of the initial design, the beginning of fabrication development, and installation of new facilities for cell manufacture. Author

N82-24698# Teledyne Energy Systems, Timonium, Md.
ADVANCED ALKALINE WATER ELECTROLYSIS
J. N. Murray *In* Courtesy Associates, Inc. Proc. of the DOE Thermal and Chem. Storage Ann. Contractor's Rev. Meeting Mar. 1981 p 175-177 refs (For primary document see N82-24652 15-44)
Avail: NTIS HC A16/MF A01

A fourth generation computer program was prepared to determine the economics of manufacturing hydrogen via alkaline water electrolysis. The program was tested by identifying the relative economic merits of the TES-C-AN cathode, the electrolysis module operating temperature range, the optimal module design current density and by comparing the published goals of the advanced alkaline technology to the published SPE goals. The stability of the TES-C-AN cathode structure is verified. The improvements possible via new node structures and new, thinner electrode separators are investigated. E.A.K.

N82-24699# Life Systems, Inc., Cleveland, Ohio.
STATIC FEED WATER ELECTROLYSIS FOR LARGE SCALE HYDROGEN GENERATION
F. H. Schubert *In* Courtesy Associates, Inc. Proc. of the DOE Thermal and Chem. Storage Ann. Contractor's Rev. Meeting Mar. 1981 p 178-181 refs (For primary document see N82-24652 15-44)
Avail: NTIS HC A16/MF A01

The static feed water electrolysis concept for aerospace application was evaluated for application in large scale hydrogen generation. The inherent potential for low cost and high performance of this alkaline electrolyte based technique was investigated. A four task program addresses the following areas: (1) definition of upper current density levels possible with the static feed concept; (2) investigation of operation with contaminated water (e.g., seawater); (3) scaleup of cell area; and (4) definition of future scale up at the cell stack and system level. The scope of each of the four program tasks is defined. E.A.K.

N82-24700# Virginia Univ., Charlottesville.
SELECTION AND EVALUATION OF MATERIALS FOR ADVANCED WATER ELECTROLYSIS
Glenn E. Stoner and Patrick J. Moran (Johns Hopkins Univ., Baltimore) *In* Courtesy Associates, Inc. Proc. of the DOE Thermal and Chem. Storage Ann. Contractor's Rev. Meeting Mar. 1981 p 182-187 refs (For primary document see N82-24652 15-44)
Avail: NTIS HC A16/MF A01

Time dependent increases in electrolysis cell voltage was investigated. It is demonstrated that an increase in the electrode potential of the nickel cathode on which hydrogen evolution occur is a significant portion of the increase in cell voltage. It is suggested that this cathodic phenomenon is related to the absorption of hydrogen by the nickel cathode. It is evidenced that if the absorbed hydrogen forms a nickel hydride it does not do so to any appreciable depth beneath the surface. The theory of absorption of hydrogen by nickel is supported by comparing the behavior of nickel to platinum and palladium via several electrochemical techniques. E.A.K.

N82-24701# Brookhaven National Lab., Upton, N. Y.
IMPROVED ALKALINE HYDROGEN/AIR FUEL CELLS FOR TRANSPORTATION APPLICATIONS
S. Srinivasan, J. McBreen, G. Kissel, K. V. Kordesch, F. Kulesa, E. J. Taylor, and E. Gannon *In* Courtesy Associates, Inc. Proc. of the DOE Thermal and Chem. Storage Ann. Contractor's Rev. Meeting Mar. 1981 p 188-192 refs (For primary document see N82-24652 15-44)
Avail: NTIS HC A16/MF A01

The improvement of alkaline air electrodes for air depolarized chlor/alkali cells is discussed. Some of these electrodes were evaluated in alkaline hydrogen/air fuel cells. In initial tests with 289 sq cm electrodes, power densities of 100 mW/sq cm were obtained at 0.65 V. Further improvements in the air electrode flow field yielded power densities of 126 mW/sq cm at 0.65 V at an operating temperature of 70 C. The 289 sq cm cells were units in a 16 cell 0.5 kW module. This module yielded similar power densities and its power/weight and power/volume are considered as a building block for a fuel cell power plant in a fuel cell/battery hybrid vehicle. E.A.K.

N82-24702# City Univ. of New York, N. Y. Dept. of Physics.
OPTICAL CONSTANTS OF SINGLE CRYSTALS Ir2 AND RuO2 AND THEIR RELATION TO ELECTRONIC STRUCTURE
A. Goel, G. Skorinko, and Fred H. Pollak *In* Courtesy Associates, Inc. Proc. of the DOE Thermal and Chem. Storage Ann. Contractor's Rev. Meeting Mar. 1981 p 193-199 refs (For primary document see N82-24652 15-44)
(Contract EC-77-S-02-4590)
Avail: NTIS HC A16/MF A01

A novel design for water electrolysis using a solid polymer electrolyte was developed. Ruthenium is one of the best electrocatalysts for the oxygen evolution reaction. There are problems connected with the significant loss in electrocatalytic activity with time. This performance degradation is presumably due to the gradual formation of an RuO2 film. Variations of catalytic activity and the intrinsic reflectivity of RuO2 and IrO2 were also investigated. Measurements of the spectral dependence are extremely valuable in elucidating the electronic properties. Results of reflectivity measurements of single crystals are compared with the band structure calculations of Mattheiss giving information concerning the nature of the d-electrons in these materials. E.A.K.

N82-24703# Teitel (Robert J.) Associates, San Diego, Calif.
MICROCAVITY STORAGE UPDATE, 1980
Robert J. Teitel *In* Courtesy Associates, Inc. Proc. of the DOE Thermal and Chem. Storage Ann. Contractor's Rev. Meeting Mar. 1981 p 197-200 refs (For primary document see N82-24652 15-44)
Avail: NTIS HC A16/MF A01

Two microsphere grades were evaluated for hydrogen storage in automotive applications. The 3M grade came the closest to meeting the automotive requirements. The hydrogen weight density attained was 0.053. Test procedures were standardized and eight grades were evaluated. Crush tests were performed in hydrogen, nitrogen and helium atmospheres. Some grades appeared to be more resistant to crushing in hydrogen and helium than in nitrogen. The aspect ratio of the eight grades of microsphere beds were measured and correlated to the crush test survivor results. It is indicated that an average microsphere aspect ratio of about 30 is needed to survive a 6000 psi crush. Measured average aspect ratios on survivors of 6000 psig crush were between 31 and 39. The hydrogen storage density attained was .042. E.A.K.

N82-24704# Brookhaven National Lab., Upton, N. Y.
AMMONIA AS A HYDROGEN ENERGY-STORAGE MEDIUM
Gerald Strickland *In* Courtesy Associates, Inc. Proc. of the DOE Thermal and Chem. Storage Ann. Contractor's Rev. Meeting Mar. 1981 p 201-203 refs (For primary document see N82-24652 15-44)
Avail: NTIS HC A16/MF A01

Liquid Hydrogen (LH2), Methanol (MeOH), and Ammonia (NH3) are compared as hydrogen energy-storage media on the basis of reforming the MeOH to produce H2 and dissociating (cracking) the NH3 to release H2. The important factors in this storage concept are discussed. It is shown that, in terms of energy input for media manufacture from natural gas, hydrogen energy content of the medium, and energy cost NH3 has a wide advantage and comes the closest to matching gasoline. The tasks required in developing a safe and practical hydrogen energy-storage system based on the storage and cracking of NH3 are listed. E.A.K.

N82-24705# Billings Energy Corp., Independence, Mo.
MODIFICATION AND OPERATION OF THE HYDROGEN HOMESTEAD HYDRIDE VESSEL ENERGY STORAGE SYSTEM
Roger E. Billings *In* Courtesy Associates, Inc. Proc. of the DOE Thermal and Chem. Storage Ann. Contractor's Rev. Meeting Mar. 1981 p 204-210 refs (For primary document see N82-24652 15-44)
Avail: NTIS HC A16/MF A01

The safe storage of the hydrogen fuel for use in hydrogen energy was studied. The performance characteristics of bulk hydride storage is investigated. Experimental design and operating proceedings are described which include: hydrogen production, drying, purification and safety system drying, as well as the monitoring of flow, temperature, pressure data and girth measurement. E.A.K.

N82-24706# Factory Mutual Research Corp., Norwood, Mass.
HYDROGEN MICROSPHERE HAZARD EVALUATION
R. G. Zalosh and S. N. Bajpai *In* Courtesy Associates, Inc. Proc. of the DOE Thermal and Chem. Storage Ann. Contractor's Rev. Meeting Mar. 1981 p 211-213 refs (For primary document see N82-24652 15-44)
Avail: NTIS HC A16/MF A01

Progress on a preliminary hazard evaluation of hollow glass microspheres for hydrogen transport and storage is reported. The flammability and explosibility of representative hydrogen filled microspheres was assessed. The tests include dust cloud explosion; flame propagation; impact sensitivity; spark ignition; and autoignition furnace. The microspheres can be ignited and propagate flame either in the quiescent bulk form or as a suspended cloud. A preliminary comparison with flammability data for gaseous hydrogen and iron titanium hydride powder indicate that the autoignition temperature of hydrogen filled microspheres is comparable to that or the other forms of hydrogen, but suspended clouds of microspheres produce lower explosion pressures than hydride dust or hydrogen gas. Safety codes and government regulations pertinent to hydrogen filled microspheres are also reviewed. E.A.K.

N82-24707# New York State Energy Research and Development Authority, Albany.
HYDROPOWERED ELECTROLYSIS IN NEW YORK STATE
Parker D. Malthusa and Rudolf A. Wiley *In* Courtesy Associates, Inc. Proc. of the DOE Thermal and Chem. Storage Ann. Contractor's Rev. Meeting Mar. 1981 p 214-217 refs (For primary document see N82-24652 15-44)
Avail: NTIS HC A16/MF A01

An inventory of New York State's hydropower potential located more than 1,000 sites with dams in the state which could be refurbished for power production. It is estimated that these facilities can be made to generate 3.8 billion kilowatt hours of (firm) electrical power per annum. It is found that the use of excess power to operate an advanced technology solid polymer electrolyzer produces research grade hydrogen whose kilowatt hour equivalent value is more than 10 times greater than that of dumped electrical energy. E.A.K.

N82-24708# Institute of Gas Technology, Chicago, Ill.
STUDY OF THE BEHAVIOR OF GAS DISTRIBUTION EQUIPMENT IN HYDROGEN SERVICE, PHASE 2
W. J. Jasionowski and H. D. Huang *In* Courtesy Associates, Inc. Proc. of the DOE Thermal and Chem. Storage Ann. Contractor's Rev. Meeting Mar. 1981 p 218-223 refs (For primary document see N82-24652 15-44)
Avail: NTIS HC A16/MF A01

The characteristics of gas distribution pipe in hydrogen service was studied. In experiments with three types of polyethylene natural gas piping, hydrogen permeation was found to be 4 to 6 times greater than methane permeation. Leakage experiments with methane/hydrogen blends showed no selective leakage of hydrogen via Poiseuille, turbulent, or orifice flow through leaks. Leak rates increased with increasing pressure and decreasing specific gravity. It is concluded that 13.7 x 10 to the 6th power SCF of natural gas could be lost annually in the U.S. by permeation; if hydrogen were distributed, the comparable loss would be 67.4 x 10 to the 6th. power. E.A.K.

N82-24709*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
CONTAINMENT MATERIALS: STATUS AND SUMMARY
Howard G. Nelson *In* Courtesy Associates, Inc. Proc. of the DOE Thermal and Chem. Storage Ann. Contractor's Rev. Meeting Mar. 1981 p 224-226 refs (For primary document see N82-24652 15-44)
Avail: NTIS HC A16/MF A01

The hydrogen containment materials are studied. The safe, reliable, and economic containment of hydrogen is essential to the success of virtually any hydrogen energy transport and storage scheme. The potential problems associated with hydrogen containment are presented. S.L.

N82-24710*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
PRODUCTION COST COMPARISONS OF HYDROGEN FROM FOSSIL AND NUCLEAR FUEL AND WATER DECOMPOSITION
Karl R. Ekman *In* Courtesy Associates, Inc. Proc. of the DOE Thermal and Chem. Storage Ann. Contractor's Rev. Meeting 6 Mar. 1981 p 227-231 refs Sponsored in cooperation with DOE (For primary document see N82-24652 15-44)
Avail: NTIS HC A16/MF A01

The comparative costs entailed in producing hydrogen by major technologies that rely on petroleum, natural gas, coal, thermochemical cycles, and electrolysis are examined. Techniques were developed for comparing these processes by formulating the process data and economic assessments on a uniform and consistent basis. These data were normalized to permit a meaningful comparative analysis of product costs of these processes. S.L.

N82-24711*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
RECENT WORK IN ADVANCED HYDROGEN PRODUCTION CONCEPTS
D. D. Lawson *In* Courtesy Associates, Inc. Proc. of the DOE Thermal and Chem. Storage Ann. Contractor's Rev. Meeting Mar. 1981 p 232 refs (For primary document see N82-24652 15-44)
Avail: NTIS HC A16/MF A01

The hydrogen photoelectrolytic conversion activity investigated the practicability of semiconductor electrolytic devises that use solar energy to decompose water into hydrogen and oxygen in an apparent single step process. The photocatalytic decomposition of inorganic hydrogen compounds; i.e., hydrobromic and hydriodic acids using rhodium organic bridge complexes were also studied. The feasibility of direct high temperature thermal decompositions of water with diffusion processes for separation of the equilibrium mixture of hydrogen and oxygen into usable energy sources was examined. S.L.

N82-24712*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
PRODUCTION OF HYDROGEN BY ELECTRON TRANSFER CATALYSIS USING CONVENTIONAL AND PHOTOCHEMICAL MEANS
D. Paul Rillema *In* Courtesy Associates, Inc. Proc. of the DOE Thermal and Chem. Storage Ann. Contractor's Rev. Meeting Mar. 1981 p 233-236 refs (For primary document see N82-24652 15-44)
Avail: NTIS HC A16/MF A01

Alternate methods of generating hydrogen from the sulfuric acid thermal or electrochemical cycles are presented. A number of processes requiring chemical, electrochemical or photochemical

methods are also presented. These include the design of potential photoelectrodes and photocatalytic membranes using Ru impregnated nafion tubing, and the design of experiments to study the catalyzed electrolytic formation of hydrogen and sulfuric acid from sulfur dioxide and water using quinones as catalysts. Experiments are carried out to determine the value of these approaches to energy conversion. S.L.

N82-24713# General Atomic Co., San Diego, Calif.
THE DEVELOPMENT OF THE GENERAL ATOMIC THERMOCHEMICAL WATER-SPLITTING PROCESS Progress Report
G. E. Besenbruch, C. L. Allen, L. C. Brown, K. McCorkle, Y. S. Rode, Y. H. Norman, P. Trester, and R. Sharp *In* Courtesy Associates, Inc. Proc. of the DOE Thermal and Chem. Storage Ann. Contractor's Rev. Meeting Mar. 1981 p 237-242 refs (For primary document see N82-24652 15-44)
Avail: NTIS HC A16/MF A01

Thermochemical water splitting was investigated. The main advantages of the cycle are that it can be conducted as an all liquid and gas phase process and that its unit operations are simple, industry-developed processes like distillation, vaporization, and phase separation. S.L.

N82-24714# Westinghouse Electric Corp., Pittsburgh, Pa.
DEVELOPMENT STATUS OF THE SULFUR CYCLE ELECTROLYSIS TECHNOLOGY
P. W. T. Lu, R. L. Ammon, and G. H. Parker *In* Courtesy Associates, Inc. Proc. of the DOE Thermal and Chem. Storage Ann. Contractor's Rev. Meeting Mar. 1981 p 243-247 refs (For primary document see N82-24652 15-44)
Avail: NTIS HC A16/MF A01

Electrode fabrication techniques and cell configuration have substantially improved both the cell voltage and the performance stability. While operating in 50 w/o sulfuric acid at 50 C and 1 atm, the measured cell voltage of an SO2 depolarized electrolyzer was 736 mV (including ohmic loss) at 200 mA/sq. cm. A one week endurance test was successfully conducted at 100 mA/sq cm., and a stabilized cell voltage of 675 mV was achieved after 80 hours of continous operation. The resulting gas from the test cell contained 98.7 v/o hydrogen. Experimental efforts also included kinetic studies on metal electrodes, measurements of temperature effects on electrode kinetics, investigations of electrocatalytic activities of metal electrodes, cyclic voltametric studies and evaluation of alternate catalysts. S.L.

N82-24715# Institute of Gas Technology, Chicago, Ill.
STUDIES ON THERMOCHEMICAL WATER-SPLITTING CYCLES
R. J. Remick and S. E. Foh *In* Courtesy Associates, Inc. Proc. of the DOE Thermal and Chem. Storage Ann. Contractor's Rev. Meeting Mar. 1981 p 248-251 refs (For primary document see N82-24652 15-44)
Avail: NTIS HC A16/MF A01

The electrochemical oxidation of sulfur dioxide in relative dilute (less than 50 weight percent) sulfuric acid was assessed, and the preferred operating conditions (acid concentration, temperature, electrode materials) for such a cell to be mated with a metal oxide metal sulfate water splitting cycle was determined. Rough performance goals were 200 mA/sq cm at 0.5 V. A sulfuric acid concentration of 33 weight percent was chosen for the experiments. As both anode and cathode performance increased with temperature in the range investigated (0 to 75 C), a temperature of 75 C or higher appears to be optimal. Of the five materials examined, smooth or platinized platinum gave the best anode kinetics for a given potential. S.L.

N82-24716*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
MAGNETIC HEADING REFERENCE Patent Application
H. Douglas Garner, inventor (to NASA) Filed 9 Apr. 1982 20 p
(NASA-Case-LAR-12638-1; US-Patent-Appl-SN-367187) Avail: NTIS HC A02/MF A01 CSCL 10C

A device for generating a signal indicative of the difference between the actual heading and the selected heading of a vehicle was invented. Magnetometers, demodulators, inventors, a calibrated dial, a mechanical sine/cosine mechanism, a polarized light resolver, and a printed circuit resolver comprise the principal components. N.W.

N82-24717*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
HIGH VOLTAGE V-GROOVE SOLAR CELL Patent Application
J. C. Evans, Jr., A. T. Chai, and C. P. Goradia, inventors (to NASA) Filed 18 Mar. 1982 11 p
(NASA-Case-LEW-13401-2; US-Patent-Appl-SN-359388) Avail: NTIS HC A02/MF A01 CSCL 10A

A high voltage multijunction solar cell is disclosed. The cell is composed of a plurality of discrete voltage generating regions, or unit cells, which are formed in a single semiconductor wafer and are connected together so that the voltages of the individual cells are additive. The unit cells comprise doped regions of opposite conductivity types separated by a gap. V-shaped grooves are formed in the wafer and thereafter the wafer is oriented so that ions of one conductivity type can be implanted in one face of the groove while the other face is shielded. A metallization layer is applied and selectively etched away to provide connections between the unit cells. NASA

N82-24718*# Tracor MB Associates, San Ramon, Calif.
PROCESS DEVELOPMENT FOR AUTOMATED SOLAR CELL AND MODULE PRODUCTION. TASK 4: AUTOMATED ARRAY ASSEMBLY Quarterly Report
John J. Hagerty 15 Jul. 1981 42 p
(Contract JPL-955699)
(NASA-CR-168922; JPL-9950-574; DOE/JPL-955699-81/04; NAS 1.26:168922; MB-R-81/11; QR-4) Avail: NTIS HC A03/MF A01 CSCL 10A

The Unimate robot was progammed for the final 35 cell pattern to be used in the fabrication of the deliverable modules. Mechanical construction of the Automated Lamination Station and Final Assembly Station were completed on schedule. All final wiring and interconnect cables were also completed and the first operational testing began. The final controlling program was written. A local fabricator was contracted to produce the glass reinforced concrete panels to be used for testing and deliverables. A video tape showing all three stations in operation was produced. N.W.

N82-24719*# Tracor MB Associates, San Ramon, Calif.
PROCESS DEVELOPMENT FOR AUTOMATED SOLAR CELL AND MODULE PRODUCTION. TASK 4: AUTOMATED ARRAY ASSEMBLY Quarterly Report
John J. Hagerty 15 Jan. 1981 42 p
(Contract JPL-955699)
(NASA-CR-168923; JPL-9950-475; DOE/JPL-955600-81/02; NAS 1.26:168923; MBR-81/01; QR-2) Avail: NTIS HC A03/MF A01 CSCL 10A

The cell preparation station was installed in its new enclosure. Operation verification tests were performed. The detailed layout drawings of the automated lamination station were produced and construction began. All major and most minor components were delivered by vendors. The station framework was built and assembly of components begun. Author

N82-24720*# General Electric Co., Cincinnati, Ohio. Advanced Energy Dept.
A CONCEPTUAL DESIGN STUDY OF A HIGH TEMPERATURE SOLAR THERMAL RECEIVER Final Report
C. S. Robertson, C. L. Ehde, L. E. Stacy, S. S. Abujawdeh, R. Narayanan, L. R. McCreight, A. Gatti, and H. W. Rauch, Sr. 4 Jan. 1980 160 p refs Prepared for JPL
(Contract JPL-955455)
(NASA-CR-168925; JPL-9950-483; NAS 1.26:168925; GEEP-66) Avail: NTIS HC A08/MF A01 CSCL 10A

A conceptual design was made for a solar thermal receiver capable of operation in the 1095 to 1650 C (2000 to 3000 F) temperature range. This receiver is designed for use with a two-axis paraboloidal concentrator in the 25 to 150 kW sub t power range, and is intended for industrial process heat, Brayton engines, or chemical/fuels reactions. Three concepts were analyzed parametrically. One was selected for conceptual design. Its key feature is a helical coiled tube of sintered silicon nitride which

serves as the heat exchanger between the incident solar radiation and the working fluid. A mechanical design of this concept was prepared, and both thermal and stress analysis performed. The analysis showed good performance, low potential cost in mass production, and adaptability to both Brayton cycle engines and chemical/fuels production. B.W.

N82-24721*# Carnegie-Mellon Univ., Pittsburgh, Pa. Mechanical Engineering and Public Policy.
SAFETY AND LIABILITY CONSIDERATIONS FOR PHOTOVOLTAIC MODULES/PANELS
A. S. Weinstein and D. G. Meeker Jan. 1981 56 p refs Prepared for JPL
(Contract JPL-955846)
(NASA-CR-168938; DOE/JPL-955846-81/1; NAS 1.26:168938) Avail: NTIS HC A04/MF A01 CSCL 10A

An overview of legal issues as they apply to design, manufacture, and use is presented. A methodology to be used during design of a photovoltaic module/array to minimize or eliminate perceived hazards is suggested. T.M.

N82-24722*# Westinghouse Electric Corp., Trafford, Pa. Power Circuit Breaker Div.
DEVELOPMENT OF A PROCESS FOR HIGH CAPACITY ARC HEATER PRODUCTION OF SILICON FOR SOLAR ARRAYS Final Technical Report
Thomas N. Meyer 1980 250 p refs
(Contract JPL-954589)
(NASA-CR-168933; JPL-9950-491; DOE/JPL-954589-80/9; NAS 1.26:168933) Avail: NTIS HC A11/MF A01 CSCL 10A

A high temperature silicon production process using existing electric arc heater technology is discussed. Silicon tetrachloride and a reductant, liquid sodium, were injected into an arc heated mixture of hydrogen and argon. Under these high temperature conditions, a very rapid reaction occurred, yielding silicon and gaseous sodium chloride. Techniques for high temperature separation and collection of the molten silicon were developed. The desired degree of separation was not achieved. The electrical, control and instrumentation, cooling water, gas, SiCl4, and sodium systems are discussed. The plasma reactor, silicon collection, effluent disposal, the gas burnoff stack, and decontamination and safety are also discussed. Procedure manuals, shakedown testing, data acquisition and analysis, product characterization, disassembly and decontamination, and component evaluation are reviewed. N.W.

N82-24723*# Kayex Corp., Rochester, N. Y.
DEVELOPMENT OF ADVANCED CZOCHRALSKI GROWTH PROCESS TO PRODUCE LOW COST 150 kg SILICON INGOTS FROM A SINGLE CRUCIBLE FOR TECHNOLOGY READINESS Quarterly Progress Report, 1 Oct. - 31 Dec. 1980
31 Dec. 1980 16 p
(Contract JPL-955733)
(NASA-CR-168924; JPL-9950-544; DOE/JPL-955733-80/1; NAS 1.26:168924; QPR-1) Avail: NTIS HC A02/MF A01 CSCL 10A

The design and development of an advanced Czochralski crystal grower are described. Several exhaust gas analysis system equipment specifications studied are discussed. Process control requirements were defined and design work began on the melt temperature, melt level, and continuous diameter control. Sensor development included assembly and testing of a bench prototype of a diameter scanner system. M.D.K.

N82-24724*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A 50 AH NICKEL CADMIUM BATTERY ACTIVATION AND CHARGE RETENTION PARAMETRIC STUDY FOR LANDSAT-D
Michael Tasevoli Jan. 1982 25 p ref
(NASA-TM-83897; NAS 1.15:83897) Avail: NTIS HC A02/MF A01 CSCL 10C

An alternate nickel-cadmium cell activation scheme was developed which significantly reduces battery dissipation while maintaining the cell active material in the proper electrochemical state. The new procedure of charging at C/20 for 8 hours, C/10 for 6 hours and followed by C/5 to a voltage limit of 1.430 volt/cell significantly reduces the heat dissipation and charge period when compared to the standard activation practice of charging at C/20 for 48 hours. In addition, subsequent discharge voltage profiles using the new scheme are higher when compared to the standard practice. The effects of extended open-circuit periods on nickel-cadmium cell results in a capacity loss of approximately 0.7 percent and 1.4 percent per day at 23 and 35 degrees Celsius, respectively. Author

N82-24725*# Westinghouse Electric Corp., Concordville, Pa.
LOW NOx HEAVY FUEL COMBUSTOR CONCEPT PROGRAM. PHASE 1: COMBUSTION TECHNOLOGY GENERATION Final Report
H. G. Lew, D. R. Carl, G. Vermes, E. A. DeZubay, J. A. Schwab, and D. Prothroe Oct. 1981 143 p refs
(Contract DEN3-146; DE-AI01-77ET-13111)
(NASA-CR-165482; DOE/NASA/0146-1; NAS 1.26:165482) Avail: NTIS HC A07/MF A01 CSCL 10B

The viability of low emission nitrogen oxide (NOx) gas turbine combustors for industrial and utility application. Thirteen different concepts were evolved and most were tested. Acceptable performance was demonstrated for four of the combustors using ERBS fuel and ultralow NOx emissions were obtained for lean catalytic combustion. Residual oil and coal derived liquids containing fuel bound nitrogen (FBN) were also used at test fuels, and it was shown that staged rich/lean combustion was effective in minimizing the conversion of FBN to NOx. The rich/lean concept was tested with both modular and integral combustors. While the ceramic lined modular configuration produced the best results, the advantages of the all metal integral burners make them candidates for future development. An example of scaling the laboratory sized combustor to a 100 MW size engine is included in the report as are recommendations for future work. Author

N82-24726# California Univ., Berkeley. Lawrence Berkeley Lab. Materials and Molecular Research Div.
INITIAL STUDY OF AN AMBIENT-TEMPERATURE RECHARGEABLE LITHIUM-SULFUR Final Report, 1 Jun. - 30 Nov. 1980
William Bowden and A. N. Dey Jun. 1981 33 p refs
(Contract W-7405-eng-48)
(DE82-000805; LBL-13264) Avail: NTIS HC A03/MF A01

All-inorganic Li/SO2 prototype rechargeable D cells were made with reference electrodes and it was demonstrated that SO2 is deposited quantitatively in the catalytic carbon cathode as lithium dithionite ($Li_2S_2O_4$) during cell discharge. It was demonstrated that the $Li_2S_2O_4$ is then quantitatively oxidized to SO2 during the recharge portion of the cell cycle, according to the overall reaction: $2Li + 2SO_2$ reversible $Li_2S_2O_4$. It was found that the electrolyte salt $Li_2B_{10}Cl_{10}$ is oxidized in solution at slightly over the recharge potential of Li/SO2 to give a one electron oxidation product. The oxidation product undergoes a further one electron oxidation to give a second product at potentials greater than those attained in cell recharge. DOE

N82-24727# Pacific Northwest Lab., Richland, Wash.
OVERVIEW OF ENERGY-CONSERVATION RESEARCH OPPORTUNITIES. EXECUTIVE SUMMARY
W. J. Hopp, S. G. Hauser, G. J. Hane, W. E. Gurwell, S. P. Bird, W. C. Cliff, R. E. Williford, T. A. Williams, and W. B. Ashton Nov. 1981 21 p refs
(Contract DE-AC06-76RL-01830)
(DE82-004031; PNL-3944-Ex-Summ) Avail: NTIS HC A02/MF A01

Research opportunities that are important to developing advanced technologies for efficient energy use are presented. A wide array of attractive technical areas from which specific research and development programs could be implemented are described. Research areas are presented for potential application in each of the major energy end-use sectors. The analysis employs a systematic process for both identifying and screening candidate energy conservation research areas. Aggregate energy consumption was reviewed and explicity criteria were employed to evaluate the technology research areas. DOE

N82-24728# Pacific Northwest Lab., Richland, Wash.
BUILDING AND OCCUPANT CHARACTERISTICS AS DETERMINANTS OF RESIDENTIAL ENERGY CONSUMPTION
L. A. Nieves and A. I. Nieves Oct. 1981 82 p
(Contract DE-AC06-76RL-01830)
(DE82-002417; PNL-4012) Avail: NTIS HC A05/MF A01

The probable effects of building energy performance standards on energy consumption were studied. Observations of actual residential energy consumption that could affirm or disaffirm consumption estimates of the Department of Energy's 2.0A simulation model were obtained. Home owner's conservation investments and home purchase decisions were investigated. The investigation of determinants of household energy consumption is described. The underlying economic theory and its implications are given as well as a description of the data collection procedures, of the formulation of variables, and then of data analysis and findings. The assumptions and limitations of the energy use projections generated by the DOE 2.0A model are discussed. Actual electricity data for the houses are then compared with results of the simulation. DOE

N82-24729# Mid-American Solar Energy Complex, Minneapolis, Minn.
SUMMARY OF DESIGNS FOR NEW RESIDENTIAL SINGLE-FAMILY ACTIVE WATER AND SPACE HEATING
Sep. 1981 6 p refs
(Contract DE-AC02-79CS-30150)
(DE82-002280; MASEC-R-81-052) Avail: NTIS HC A02/MF A01

The history of program planning and contract negotiations are traced until the residential solar water and space heating program was dropped for lack of funding. DOE

N82-24730# Battelle Columbus Labs., Ohio.
DEVELOPMENT OF CONCEPTS FOR LOW-COST ENERGY STORAGE ASSEMBLIES FOR ANNUAL CYCLE ENERGY SYSTEM APPLICATIONS Summary Report
G. H. Alexander, D. L. Cooper, C. A. Cummings, and E. E. Reiber Oct. 1981 199 p refs
(Contract W-7405-eng-26)
(DE82-001835; ORNL/Sub-7800/1) Avail: NTIS HC A09/MF A01

Low cost energy storage assemblies were developed. In the search for low overall cost assemblies, many diverse concepts and materials were postulated and briefly evaluated. Cost rankings, descriptions, and discussions of the concepts were presented from which ORNL selected the following three concepts for the Phase 2 development: (1) a site constructed tank with reinforced concrete walls formed with specialized modular blocks which eliminates most concrete form work and provides integral R-20 insulation designated ORNLFF; (2) a site constructed tank with earth supported walls that are formed from elements common to residential, in-ground swimming pools, designated SWPL; (3) and a site assembled tank used in underground utility vaults, designated UTLBX. Detailed designs of free standing versions of the three concepts are presented. DOE

N82-24731# Oak Ridge National Lab., Tenn.
ENERGY CONSUMED IN 2010 BY AN ENERGY-EFFICIENT BUILDING SECTOR
G. D. Pine Nov. 1981 71 p refs
(Contract W-7405-eng-26)
(DE82-003520; ORNL-5772) Avail: NTIS HC A04/MF A01

The minimum practical energy consumption in the building sector in the year 2010 if an aggressive program of efficiency improvement were implemented was estimated. For the case of a 2% annual growth rate in real gross national product, an 0.8% annual growth in population, and a quadrupling of real fuel prices relative to the 1975 prices, we concluded that end-use fuel consumption by the building sector could be reduced to 7.7 exajoule (EJ) in 2010 compared to 18.0 EJ in 1977. This could be accomplished by using technologies that are available today or can be predicted with a high level of confidence to be available in 2010. No technological breakthroughs would be required, and no sacrifice in amenities would be necessary. Indeed, the real standard of living would improve. Futhermore, the results were only slightly sensitive to fuel prices; most efficiency improvements were attractive economically at today's fuel prices or at prices only slightly higher. DOE

N82-24732# Oak Ridge National Lab., Tenn. Fossil Energy Materials Office.
FOSSIL-ENERGY MATERIALS PROGRAM Quarterly Progress Report, period ending 30 Jun. 1981
Sep. 1981 418 p ref
(Contract W-7405-eng-26)
(DE82-001057; ORNL/FMP-81/3) Avail: NTIS HC A18/MF A01

Research and development on materials for fossil energy applications with a focus on the longer term and generic needs of the various fossil fuel technologies is reported. The program includes research aimed toward a better understanding of materials behavior in fossil energy enviroments and the development of new materials capable of substantial enhancement of plant operations and reliability. Projects related to a particular fossil energy technology are described. The various projects associated with that technology are outlined. The fossil energy materials program quarterly progress reports series as a dissemination of information which is developed on the program. DOE

N82-24733# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md.
BIGMAC: BASIC INTERACTIVE GEOTHERMAL MODEL WITH AQUIFER CHARACTERIZATION: A USER'S GUIDE
Peter Kroll, William Barron, K. Yu, and William J. Toth Oct. 1981 64 p refs
(Contracts EX-76-A-36-1008; DE-AI01-79ET-27025)
(PB82-128679; JHU/APL/QM-81-089) Avail: NTIS HC A04/MF A01 CSCL 10A

A User's Guide to the Basic Interactive Geothermal Model with Aquifer Characterization (BIGMAC) is presented. This program is an enhancement of a previously published program, the Demand Specified Model (DSM), to allow representation of a geothermal aquifer's characteristics and their effects on pumping energy and drawdown. The report lists the modifications made to DSM in order to create BIGMAC, describes how to operate the program, shows samples of the program's output, and summarizes the commands available in BIGMAC. GRA

N82-25111*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
A SIMPLIFIED SOLAR CELL ARRAY MODELLING PROGRAM
R. D. Hughes *In its* The Telecommun. and Data Acquisition Rept. 15 Apr. 1982 p 167-185 refs (For primary document see N82-25092 15-99)
Avail: NTIS HC A09/MF A01 CSCL 10A

45 ENVIRONMENT POLLUTION

Includes air, noise, thermal and water pollution; environment monitoring; and contamination control.

N82-24734*# College of William and Mary, Williamsburg, Va. Dept. of Physics.
SCIENCE SUPPORT FOR THE ATMOSPHERIC TRACE MOLECULE SPECTROSCOPY (ATMOS) EXPERIMENT Final Report, May 1978 - Mar. 1982
Curtis P. Rinsland Mar. 1982 38 p refs
(Contract NCC1-3; Grant NsG-1484)
(NASA-CR-168927; NAS 1.26:168927) Avail: NTIS HC A03/MF A01 CSCL 13B

The experiment is a satellite solar occultation interferometer spectrometer experiment under development for flight on Spacelab 3. Launch is expected in March 1985. ATMOS will provide high spectral resolution (0.02/cm) and high spatial resolution (2 km from Shuttle altitude) data over the spectral range from 2 micrometers to 16 micrometers. This region of the spectrum is rich in absorption features of major and minor trace gases which are critical to the understanding of the chemistry and physics of the Earth's upper atmosphere. The broad objectives of the ATMOS experiment are to: identify and measure, on a global scale, the volume mixing ratios of known and newly

discovered molecular species; determine vertical profiles for these species; and provide spectral data on the atmosphere for use in optimizing the design of future instruments to monitor specific gases. T.M.

N82-24735*# Life Systems, Inc., Cleveland, Ohio.
ADVANCED CO2 REMOVAL PROCESS CONTROL AND MONITOR INSTRUMENTATION DEVELOPMENT
D. B. Heppner, M. J. Dalhausen, and R. Klimes Jan. 1982 70 p refs
(Contract NAS2-10674)
(NASA-CR-166284; NAS 1.26:166284; LSI-TR-427-4) Avail: NTIS HC A04/MF A01 CSCL 06K

A progam to evaluate, design and demonstrate major advances in control and monitor instrumentation was undertaken. A carbon dioxide removal process, one whose maturity level makes it a prime candidate for early flight demonstration was investigated. The instrumentation design incorporates features which are compatible with anticipated flight requirements. Current electronics technology and projected advances are included. In addition, the program established commonality of components for all advanced life support subsystems. It was concluded from the studies and design activities conducted under this program that the next generation of instrumentation will be greatly smaller than the prior one. Not only physical size but weight, power and heat rejection requirements were reduced in the range of 80 to 85% from the former level of research and development instrumentation. Using a microprocessor based computer, a standard computer bus structure and nonvolatile memory, improved fabrication techniques and aerospace packaging this instrumentation will greatly enhance overall reliability and total system availability. B.W.

N82-24736*# Old Dominion Univ., Norfolk, Va. Dept. of Geophysical Sciences.
DEVELOPMENT OF DATA PROCESSING INTERPRETATION AND ANALYSIS SYSTEM FOR THE REMOTE SENSING OF TRACE ATMOSPHERIC GAS SPECIES Progress Report, 22 Jan. 1981 - 21 Jan. 1982
Joseph C. Casas, James V. Koziana, Mary S. Saylor, and Earl C. Kindle Jun. 1982 40 p refs
(Contract NCC1-34)
(NASA-CR-168962; NAS 1.26:168962; GSTR-82-6) Avail: NTIS HC A03/MF A01 CSCL 13B

Problems associated with the development of the measurement of air pollution from satellites (MAPS) experiment program are addressed. The primary thrust of this research was the utilization of the MAPS experiment data in three application areas: low altitude aircraft flights (one to six km); mid altitude aircraft flights (eight to 12 km); and orbiting space platforms. Extensive research work in four major areas of data management was the framework for implementation of the MAPS experiment technique. These areas are: (1) data acquisition; (2) data processing, analysis and interpretation algorithms; (3) data display techniques; and (4) information production. R.J.F.

N82-24737# Los Alamos Scientific Lab., N. Mex.
AIR-QUALITY REGULATION IN SPATIAL EQUILIBRIUM MODELS
Charles D. Kolstad Sep. 1981 31 p refs Presented at the 5th Intern. Clear Air Congr., Buenos Aires, Oct. 1980
(Contract W-7405-eng-36)
(DE82-002484; LA-9019-MS) Avail: NTIS HC A03/MF A01

Methods are presented for including a wide variety of air pollution regulations within the class of economic equilibrium models where allocation is based on constrained optimization. Current air pollution regulation in the United States and possible future regulations are discussed. This is followed by the presentation of a prototype spatial equilibrium model within which a number of regulatory mechanisms are explicitly represented. These include efficient and zoned charges, statically and dynamically efficient permit systems, and technological control and hybrid permit/charge systems. DOE

N82-24738# Environmental Protection Agency, Atlanta, Ga. Region 4 Office.
TALLAHASSEE-LEON COUNTY WASTEWATER MANAGEMENT, TALLAHASSEE, LEON COUNTY, FLORIDA Draft Environmental Impact Statement
Sep. 1981 213 p refs
(PB82-106428; EPA-904/9-81-082) Avail: NTIS HC A10/MF A01 CSCL 13B

Wastewater management needs for growth areas which will not be served by 201 facilities already approved by the Environmental Protection Agency are discussed. Alternatives for wastewater management in the study area were developed and evaluated with emphasis on protection of the groundwater resources and sensitive natural systems such as flood plains and wetlands. The expansion of the existing system until the approved facilities have been constructed is discussed. New growth in wastewater generation will be handled by on site systems, small community systems, and by tying into the existing system. GRA

N82-24739# Societe Nationale Industrielle Aerospatiale, Toulouse (France). Acoustics Dept.
AIRBUS INDUSTRY AND NOISE IN THE COMMUNITY
J. Chaussonnet 7 Jan. 1982 37 p Presented at Symp. on Aircraft Noise Johannesburg, 21 Oct. 1981; sponsored by South African Acoustic Inst.
(SNIAS-821-111-111) Avail: NTIS HC A03/MF A01

The contribution to the total perceived noise outside an aircraft during takeoff and landing, attributed to engines and the aerodynamics of the aircraft, is considered. Engine noise reduction by design, location of the engine, and by acoustic analysis of the nacelle is discussed. Aerodynamic noise reduction is treated in terms of aircraft design, operational procedures, and aircraft weight. The noise measurement facility used for checking operational procedures and measuring noise levels, is described. Results show that the acoustic noise of commercial aircraft can be significantly reduced. Author (ESA)

N82-24740# Royal Netherlands Meteorological Inst., De Bilt.
CHEMICAL COMPOSITION OF PRECIPITATION OVER THE NETHERLANDS, 1978 - 1980
31 Dec. 1981 40 p Prepared in cooperation with Rijks Inst. voor de Volksgezondheid
(KNMI-156-3a; RIV-217810-004) Avail: NTIS HC A03/MF A01

Data on heavy metals, organic micropollutants, and natural isotopes are presented as monthly results, quarterly and yearly averages, and means for the three years. In 1980, the precipitation was less acidic than in 1978 and 1979, due to a lower NO3 concentration and, to a lesser extent, lower SO4 concentration. In the summer of 1980 precipitation was considerably more acidic than in the preceding winter. As in the year before, the NO3 concentration during summer was higher than the concentration in the preceding winter. Author (ESA)

N82-24741# Nichols Engineering and Research Corp., Belle Mead, N.J.
REPORT OF PYROLYSIS OF SEWAGE SLUDGES IN THE NEW YORK-NEW JERSEY METROPOLITAN AREA, PHASE 1
Sep. 1981 82 p
(Grant EPA-R-804463)
(PB82-105537; EPA-600/2-81-202) Avail: NTIS CSCL 13B

The volume of municipal wastewater (sewage) sludge in a miltiple hearth furnace via starved air combustion (pyrolysis) was reduced and compared with incineration as an environmentally acceptable method of sludge disposal. Sludge was first dewatered to 35 to 50 percent solids content in a plate and frame filter press having expandable rubber diaphragm plates. The dewatered sludge was then thermally convered to ash and/or char in a 91 m (36 inch) inside diameter pilot scale multiple hearth furnace having six hearths. Thermal conversion consisted of incineration at 900 C (1625 F) and starved air burning (pyrolysis) at 700 C (1290 F) to 800 C (1625 F). Heat contents of the off gases and the ash and/or char mixtures were determined. GRA

N82-24742# SRI International Corp., Menlo Park, Calif.
ANALYSES, EXPERIMENTAL STUDIES, AND EVALUATIONS OF CONTROL MEASURES FOR AIR FLOW AND AIR QUALITY ON AND NEAR HIGHWAYS. VOLUME 1: EXPERIMENTAL STUDIES, ANALYSES, AND MODEL

DEVELOPMENT Final Report, 1973 - 1980
Walter F. Dabberdt, Eugene Shelar, David Marimont, and George Skinner Mar. 1981 273 p refs
(Contract DOT-FH-11-8125)
(PB82-133604; FHWA/RD-81/051) Avail: NTIS HC A12/MF A01 CSCL 13B

Meteorological and air quality conditions near a broad range of complex roadway configurations are investigated. The interrelationships among traffic, meteorology, and configuration are discussed. The development of a new and versatile dispersion model, called ROADMAP, is also described together with an evaluation of the model's performance relative to measured atmospheric and wind tunnel pollutant concentration data. The experimental data indicates a significant effect of waste heat on near roadway dispersion. The combined effects of traffic movement and waste heat emissions cause increases in the turbulence intensity of up to 200% across the roadway. However, there is apparently little effect on turbulence caused by changes in traffic volume or speed (for the moderate to heavy traffic conditions present during the tests). GRA

N82-25146* National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.
SUMMARY OF PRELIMINARY RESULTS FROM THE ENVIRONMENTAL MONITORING PROGRAM FOR STS-1 LAUNCH
A. M. Koller, Jr. and W. M. Knott, III *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 1 May 1981 p 555-586 refs (For primary document see N82-25112 15-99)
Copyright. Avail: NTIS HC $60.50/MF $60.50 CSCL 13B

46 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; ionospheric and magnetospheric physics; and geomagnetism.

For space radiation see *93 Space Radiation*.

N82-24743*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MEASUREMENT OF HYDROXYL TEMPERATURES IN THE UPPER ATMOSPHERE WITH A HIGH SENSITIVITY SPECTROMETER
James H. McElaney and Abbas Khadjavi 1980 28 p refs
(Grant NGR-07-010-002)
(NASA-TM-84735; NAS 1.15:84735) Avail: NTIS HC A03/MF A01 CSCL 04A

The hydroxyl temperatures in the upper atmosphere were measured over a five-week period in January and February of 1975 and 1976 in order to determine the variation of the rotational temperatures of OH with stratospheric warming events occurring over the New England area. The OH temperatures were also recorded during the summer of 1975 in the Fairfield, Connecticut area. Data show a wide fluctuation in temperatures amounting to as much as a couple of hundred degrees in the course of an evening. A modified Ebert-Fastie spectrometer with a focal length of 1 meter was used to examined the vibration-rotation bands of atmospheric OH in the 7000 to 9000 range. This wavelength was searched and the strongest signal was obtained from the 6-2 band (band head at 8280 A). Graphs show the 6-2 band of the Meinel OH spectrum, the real time and average spectra for the 6-2 band of OH, and rotational temperature of OH vs time for two evenings. A.R.H

N82-24744# Suomalainen Tiedeakatemia, Sodankylae (Finland).
PROCEEDINGS OF THE FINNISH-AMERICAN AURORAL WORKSHOP
L. Jalonen, ed. and T. Nygren, ed. 1981 153 p refs Workshop held at Oulu, Finland, 17-20 Aug. 1981
(Rept-37; ISBN-951-41-0428-5) Avail: NTIS HC A08/MF A01

Instruments, ionospheric physics, magnetospheric physics, substorm observations, and substorm theories are discussed. For individual titles, see N82-24745 through N82-24766.

N82-24745# Finnish Meteorological Inst., Helsinki. Div. of Geomagnetism.
COORDINATED OPTICAL AURORAL OBSERVATIONS IN FINLAND
Risto Pellinen and Harald Derblom (Uppsala Ionospheric Observatory) *In* Suomalainen Tiedeakatemia The Finn.-Am. Auroral Workshop 1981 p 25-29 refs (For primary document see N82-24744 15-46)
Avail: NTIS HC A08/MF A01

All-sky camera, photometric and video recordings are described. Standard data scaling, storing and reporting methods together with data coverage, availability and usability are discussed. Examples of further data treatment techniques and scientific studies are shown. Future plans are discussed. Author

N82-24746# Oulu Univ. (Finland). Dept. of Physics.
SATELLITE IMAGERY AND ELECTRON SPECTRA (DMSP)
Pekka Tanskanen *In* Suomalainen Tiedeakatemia The Finn.-Am. Auroral Workshop 1981 p 30-34 refs (For primary document see N82-24744 15-46)
Avail: NTIS HC A08/MF A01

Observations of aurora by means of optical imagers onboard polar orbiting satellites are discussed. The defense meteorological satellite program (DMSP) is reviewed. Visual and electron spectral data from the DMSP satellite are discussed. N.W.

N82-24747# Finnish Meteorological Inst., Helsinki. Div. of Geomagnetism.
SCANDINAVIAN MAGNETOMETER NETWORKS AND DATA ANALYSIS
C. Sucksdorff *In* Suomalainen Tiedeakatemia The Finn.-Am. Auroral Workshop 1981 p 35-38 refs (For primary document see N82-24744 15-46)
Avail: NTIS HC A08/MF A01

A Scandinavian magnetometer network, comprised of 28 digital and analog magnetographs, is described. N.W.

N82-24748# Suomalainen Tiedeakatemia, Sodankylae (Finland). Geophysical Observatory.
IONOSONDES
Tauno Turunen *In its* The Finn.-Am. Auroral Workshop 1981 p 39-41 refs (For primary document see N82-24744 15-46)
Avail: NTIS HC A08/MF A01

General features of the ionosonde network in Scandinavia are discussed and some possible scientific use for it mentioned. Author

N82-24749# Oulu Univ. (Finland). Dept. of Electrical Engineering.
RIOMETER CHAIN IN FINLAND
Juhani Oksman *In* Sumalainen Tiedeakatemia The Finn.-Am. Auroral Workshop 1981 p 42-48 refs (For primary document see N82-24744 15-46)
Avail: NTIS HC A08/MF A01

The riometer chain in Finland is described. Topics studied by means of riometer data include the effect of IMF polarity on absorption, afternoon absorption, absorption in the growth phase of substorms, absorption associated with auroral omega bands and PSE in absorption. Author

N82-24750# SRI International Corp., Menlo Park, Calif. Radio Physics Lab.
LATITUDINAL MORPHOLOGY OF THE EVENING SECTOR AURORAL ZONE
Robert Robinson *In* Suomalainen Tiedeakatemia The Finn.-Am. Auroral Workshop 1981 p 49-55 refs (For primary document see N82-24744 15-46)
(Grant NSF ATM-78-23658)
Avail: NTIS HC A08/MF A01

Several operating modes were specifically designed for the radar at Chatanika, Alaska to allow the measurement of latitudinal structure of auroral zone electric fields, conductivities, and currents. These measurements are especially useful when combined with simultaneous observations made by satellites and rockets. Analysis of these data showed that the electric field structure associated with evening-sector auroral arcs is determined by the arc's position relative to auroral convection boundaries. Radar measurements, coordinated with simultaneous passes of the Triad satellite,

revealed a consistent pattern of ionization and field-aligned currents in the evening-sector auroral zone. Author

N82-24751# Suomalainen Tiedeakatemia, Sodankylae (Finland). Geophysical Observatory.
ANALYSIS PROGRAM FOR EISCAT MEASUREMENTS
Johan Silen *In its* The Finn.-Am. Auroral Workshop 1981 p 56-58 ref (For primary document see N82-24744 15-46)
Avail: NTIS HC A08/MF A01

The parameter fitting program to be used to analyze the data produced by the EISCAT radar tristatic system is described. Only details essential to outline the possibilities of the fitting schemes are included. Author

N82-24752# Suomalainen Tiedeakatemia, Sodankylae (Finland). Geophysical Observatory.
AURORAL SPORADIC E
Tauno Turunen *In its* The Finn.-Am. Auroral Workshop 1981 p 59-64 refs (For primary document see N82-24744 15-46)
Avail: NTIS HC A08/MF A01

Some general features of auroral zone Sporadic E layer are discussed and some examples are presented to show the relation between the frequency parameters of sporadic E layer and the auroral substorm. It seems that in relatively large longitude sector in the night time auroral zone the substorms are invariably followed by simultaneous increase in the blanketing frequency of Sporadic E. Author

N82-24753# Oulu Univ. (Finland). Dept. of Physics.
THE GYROECHO AND THE SORADIC E-LAYER
Tuomo Nygren, Lasse Jalonen, and Tauno Turunen (Suomalainen Tiedeakatemia) *In* Suomalainen Tiedeakatemia The Finn.-Am. Auroral Workshop 1981 p 65-68 refs (For primary document see N82-24744 15-46)
Avail: NTIS HC A08/MF A01

Generation and properties of the ionospheric gyroechoes in the presence of a thin sporadic E-layer were theoretically investigated. The intensification of the echo and the decrease of its virtual height occurring at the onset of an Es-layer are explained in terms of mode coupling. A mechanism was found capable of producing gyroechoes when an otherwise totally blanketing flat-type Es-layer was present. Author

N82-24754# Oulu Univ. (Finland). Dept. of Physics.
COUPLING INDUCED VARIATIONS IN THE Es AND E LAYER ECHO AMPLITUDES OBSERVED AT SODANKYLAE
Lasse Jalonen *In* Suomalainen Tiedeakatemia The Finn.-Am. Auroral Workshop 1981 p 69-72 refs (For primary document see N82-24744 15-46)
Avail: NTIS HC A08/MF A01

Quasi-periodic variations of the ordinary Es- and E-layer echo amplitudes as a function of frequency were observed in the ionospheric soundings carried out at the Sodankyla Geophysical Observatory. The variations are explained in terms of interference resulting from mode coupling on steep electron density gradients at the bottomside of the layer. A method is presented by which gradients of the order of 10 to the 10th power - 10 to the 11th power to the minus 3 power km to the minus 1 power can be determined from the observed interference patterns. Author

N82-24755# National Oceanic and Atmospheric Administration, Boulder, Colo. Space Environment Lab.
AURORAL ARC THEORY
In Suomalainen Tiedeakatemia The Finn.-Am. Auroral Workshop 1981 p 25-29 refs (For primary document see N82-24744 15-46)
Avail: NTIS HC A08/MF A01

The observed magnitudes of the field-aligned current density sub 11 and the field-aligned potential difference V sub 11 over aurora, and the observed relation between them, are quantitatively explained by considering nothing more than the uninhibited, single-particle motion along field lines. It is shown that the sub 11 versus V sub 11 relation from single-particle motion, together with the ionospheric current continuity equation, can account for the overall electrodynamics (i.e., particle acceleration, precipitating electron energy fluxes, currents, and electric potentials) of large scale 'inverted-V' and discrete auroral precipitation regions. The inverted-V scale sizes is a natural result of the current versus electric potential relations along field lines and in the ionosphere, whereas the discrete auroral scale size results from specific structure in the electric potential distribution deep within the magnetosphere. Author

N82-24756# Alaska Univ., Fairbanks. Geophysical Inst.
DISTINGUISHING THE PEDESEN AND HALL CURRENTS IN THE IONOSPHERE
S.-I. Akasofu *In* Suomalainen Tiedeakatemia The Finn.-Am/ Auroral Workshop 1981 p 78-84 refs (For primary document see N82-24744 15-46)
Avail: NTIS HC A08/MF A01

One of the most important tasks in understanding the generation mechanisms of the magnetospheric current system is to determine separately the distribution of the Pedersen current J sub p and the Hall current J sub H, rather than the distribution of the total ionospheric current. The reasons for this were demonstrated by using the global distribution of J sub p and J sub H. The following five points are described in detail for the global scale distribution of the Pedersen and the Hall current: (1) the Pedersen current; (2) the magnetospheric plasma; (3) the primary Pedersen current; (4) the Hall current; and, (5) the divergence of J sub H. M.D.K.

N82-24757*# Stanford Univ., Calif. Inst. for Plasma Research.
IS ENERGY STORAGE AND RELEASE PART OF THE SUBSTORM PROCESS?
C. Robert Clauer *In* Suomalainen Tiedeakatemia The Finn.-Am. Auroral Workshop 1981 p 85-97 refs (For primary document see N82-24744 15-46)
(Contracts NAS5-24420; N00014-76-C-0207; Grants NSF ATM-80-20421; NSF ATM-80-20376 NGR-05-020-559)
Avail: NTIS HC A08/MF A01 CSCL 04A

Models for magnetospheric substorms were considered. A modified model which includes the growth phase, a time interval prior to the onset of the expansion phase, during which energy was transferred from a solar wind to the magnetosphere and stored for subsequent release, is discussed. Evidence for energy storage in the tail prior to substorm expansion for both isolated and moderate substorm activity is reviewed. M.D.K.

N82-24758# Muenster Univ. (West Germany). Inst. fuer Geophysik.
SUBSTORM CURRENT SYSTEMS
Wolfgang Baumjohann *In* Suomalainen Tiedeakatemia The Finn.-Am. Auroral Workshop 1981 p 98-103 refs Sponsored by the Deutsche Forschungsgemeinschaft (For primary document see N82-24744 15-46)
Avail: NTIS HC A08/MF A01

Observations made by the dense, multi-method geophysical network in Scandinavia were used to obtain some new insights into the nature and the temporal and spatial development of auroral zone currents during the growth phase and the trigger phase before a weak substorm onset, during a multiple onset substorm, and during the passage of a westward travelling surge. The results of these studies are summarized and their implications for substorm theories are discussed. Author

N82-24759# Uppsala Ionospheric Observatory (Sweden).
CURRENT SYSTEMS ASSOCIATED WITH SMALL SCALE AURORAL STRUCTURES
Herman J. Opgenoorth *In* Suomalainen Tiedeakatemia The Finn.-Am. Auroral Workshop 1981 p 104-108 refs (For primary document see N82-24744 15-46)
Avail: NTIS HC A08/MF A01

The dense instrument network in Scandinavia makes it possible to study the two-dimensional natural of a number of auroral phenomena, such as auroral spirals, westware travelling surges, and omega-bands. It is possible to infer realistic pictures of the associated three-dimensional current systems. The auroral features are found to be connected to longitudinal structures in the global field-aligned current distribution, probably due to both plasma sheet processes and processes on the field lines between the magnetotail and the ionosphere. Author

N82-24760# Maryland Univ., College Park. Inst. for Physical Science and Technology.
ENERGETIC ELECTRON PRECIPITATION ASSOCIATED WITH SUBSTORMS
T. J. Rosenberg *In* Suomalainen Tiedakatemia The Finn.-Am. Auroral Workshop 1981 p 109-118 refs (For primary document see N82-24744 15-46)
Avail: NTIS HC A08/MF A01

Satellite and ground measurements show that injection in the midnight sector, followed by azimuthal (eastward) drift and precipitation can adequately describe the observed behavior of auroral-zone energetic electrons in the midnight-to-noon local time sector during substorm activity. Electron precipitation in the noon-to-midnight sector is usually much weaker than in the morning and there is some evidence that electron precipitaion events in this sector may be inconsistent with such a model. However, by examining the local time dependence of ionospheric absorption and VLF emissions as a function of geomagnetic disturbance level, and comparing the results with an earlier satellite study of ELF emissions, it is found that the average behavior of electron precipitation at L approx. equal to 4 can be explained by the model for all local times and under quiet as well as disturbed conditions. Author

N82-24761# Oulu Univ. (Finland). Dept. of Physics.
MAGNETIC PULSATIONS ASSOCIATED WITH SUBSTORMS
Jorma Kangas *In* Suomalainen Tiedeakatemia The Finn-Am. Auroral Workshop 1981 p 119-123 refs (For primary document see N82-24744 15-46)
Avail: NTIS HC A08/MF A01

The American-Finnish cooperative program for magnetic pulsation studies was initiated in 1963. One of the main interests was to investigate magnetic pulsations which are observed during the magnetospheric substorm. Some of the recent developments to the studies of short period magnetic pulsations are summarized. Author

N82-24762# Alaska Univ., Fairbanks. Geophysical Inst.
SUBSTORMS AND LONG PERIOD GEOMAGNETIC PULSATIONS
John V. Olson *In* Suomazainen Tiedeakatemia The Finn.-Am. Auroral Workshop 1981 p 124-128 refs (For primary document see N82-24744 15-46)
(Grant NSF ATM-80-16166)
Avail: NTIS HC A08/MF A01

Records from ground based magnetometer arrays are shown to clarify the association between long period geomagnetic pulsations and substorm activity. It is known that Pi 2 pulsations, which are impulsive night time pulsations with periods in the range 40 < or equal to T < or equal to 150 seconds, are intimately associated with substorm onsets. The source is ionospheric and located near the Harang discontinuity. With regard to dayside Pc 4-5 pulsations, which are continuous pulsations with periods in the range 45 < or equal to T < or equal to 600 seconds. evidence shows that Pc 4-5 activity is affected by substorm onsets. These observations and the methods by which they were derived in terms of the magnetospheric changes which occur at substorm onset are discussed. T.M.

N82-24763*# Aerospace Corp., El Segundo, Calif. Space Sciences Lab.
THEORY OF THE AURORAL MAGNETOSPHERE
Michael Schulz, Y. T. Chiu, and John M. Cornwall *In* Suomalainen Tiedeakatemia The Finn.-Am. Auroral Workshop 1981 p 129-135 refs (For primary document see N82-24744 15-46)
(Contract NASw-3434)
Avail: NTIS HC A08/MF A01 CSCL 04A

The aurora is understood as a manifestation of energy transfer and plasma transfer from the solar wind to the magnetosphere. The auroral oval seems to be a mapping of the boundary layer that lies just inside the magnetospheric surface, which consists of the magnetopause and neutral sheet. The auroral oval is consequently a region of reversal for the meridional component of the magnetospheric convection electric field and thus a region of strong shear in the plasma drift velocity field. The velocity shear seems to account for the formation of eddies in the auroral curtain. Moreover, the kinematical impedance associated with hot auroral plasma in magnetic mirror geometry makes it impossible for the reversal of the perpendicular (meridional) electric field across a narrow region of latitude to occur without the formation of a large parallel electric field. T.M.

N82-24764# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Plasma Physics.
THE VIKING SATELLITE
Carl-Gunne Faelthammar *In* Suomalainen Tiedeakatemia The Finn.-Am. Auroral Workshop 1981 p 129-135 refs (For primary document see N82-24744 15-46)
Avail: NTIS HC A08/MF A01

The satellite is spin stabilized (3 rpm) in a cartwheel mode and contains experiments for measuring electric fields (d.c. and a.c.), magnetic fields (d.c. and a.c.), plasma density and temperature, energetic particle fluxes and composition, as well as an experiment for making UV images of the ionosphere below. It will address a variety of scientific problems with particular emphasis on those related to auroral processes. Author

N82-24765# Pacific Northwest Lab., Richland, Wash.
A MULTIPURPOSE, COMPUTER CONTROLLED MOBILE AUTOMATIC SCANNING PHOTOMETER (MASP)
E. W. Kleckner, J. J. Michalsky, L. L. Smith, J. R. Schmelzer, R. H. Severtsen, J. L. Berndt, and D. W. Slater *In* Suomalainen Tiedeakatemia The Finn.-Am. Auroral Workshop 1981 p 141-148 refs Sponsored in cooperation with DOE (For primary document see N82-24744 15-46)
(Grant NSF ATM-78-12313)
Avail: NTIS HC A08/MF A01

The design for a photometer capable of measuring optical radiation ranging in intensity from the subvisual light levels associated with night sky airglow emissions to the intense flux levels of direct sunlight is described. The instrument has twelve interference filters for wave length selection, a 2.5 deg field of view for nighttime observations and a 1.5 deg field of view for daytime observations. A photomultiplier tube is used as the low light level detector, and a silicon PIN photodiode serves as the insulation detector. A particular measurement sequence is programmed into the instrument but can be modified by the reading of a new program cassette tape in the field. Normal operation is fully automatic. T.M.

N82-24766# Suomalainen Tiedeakatemia, Sodankylae (Finland).
THE EISCAT COMMON PROGRAMME AT UHF
Phil Williams *In* Suomalainen Tiedeakatemia The Finn.-Am. Auroral Workshop 1981 p 149-153 refs (For primary document see N82-24744 15-46)
Avail: NTIS HC A08/MF A01

The EISCAT UHF system made measurements of incoherent scatter spectra in June 1981. However, the transmitter was unable to operate at the full peak power of 2 MW and neither was it able to use the full range of frequencies. It was decided that initially EISCAT would begin routine operations using a program as simple as possible which could provide useful results with only 500 kW peak power, and with only two frequencies in use. The program, called Common Program Zero (CP 0), is described. T.M.

N82-24767*# Colorado Univ., Boulder. Cooperative Inst. for Research in Environmental Sciences.
NUTATION AND POLAR MOTION OF THE EARTH Final Report
Martin L. Smith [1982] 133 p refs
(Contract NAS5-25887)
(NASA-CR-166798; NAS 1.26:166789) Avail: NTIS HC A07/MF A01 CSCL 08E

Effects of nonconservative (dissipative) processes in the Earth were studied. Specifically, the magnetic, viscous, and topographic coupling at the core-mantle boundary and the effects of physical dispersion due to anelasticity in the Earth's rheology were investigated and are described. M.D.K.

N82-24768*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE DEVELOPMENT OF SELECTED DATA BASE APPLICATIONS FOR THE CRUSTAL DYNAMICS DATA INFORMATION SYSTEM

Carey E. Noll 16 Dec. 1981 63 p refs
(NASA-TM-83886; NAS 1.15:83886) Avail: NTIS HC A04/MF A01 CSCL 08G

The development of a data base and its accompanying software for the data information system of crustal dynamics project is described. Background information concerning this project, and a definition of the techniques used in the implementation of an operational data base, are presented. Examples of key applications are included and interpreted. S.L.

N82-24769*# Aerospace Corp., El Segundo, Calif. Space Sciences Lab.
KINETIC RESPONSE OF IONOSPHERIC IONS TO ONSET OF AURORAL ELECTRIC FIELDS
Y. T. Chiu and J. R. Kan (Alaska Univ., Fairbanks) 27 Jul. 1981 38 p refs
(Contract NASw-3434)
(NASA-CR-168696; NAS 1.26:168696; ATR-81(7951)-3) Avail: NTIS HC A03/MF A01 CSCL 04A

Examination of the exact analytic solution of a kinetic model of collisional interaction of ionospheric fions with atmospheric neutrals in the Bhatnagar-Gross-Krook approximation, shows that the onset of intense auroral electric fields in the topside ionosphere can produce the following kinetic effects: (1) heat the bulk ionospheric ions to approximately 2 eV, thus driving them up to higher altitudes where they can be subjected to collisionless plasma processes; (2) produce a nonMaxwellian superthermal tail in the distribution function; and (3) cause the ion distribution function to be anisotropic with respect to the magnetic field with the perpendicular average thermal energy exceeding the parallel thermal energy. Author

N82-24770*# Illinois Univ., Urbana. Dept. of Electrical Engineering.
INVESTIGATION OF THE WINDS AND ELECTRON CONCENTRATION VARIABILITY IN THE D REGION OF THE IONOSPHERE BY THE PARTIAL-REFLECTION RADAR TECHNIQUE
R. M. Weiland and S. A. Bowhill 1 Dec. 1981 237 p refs
(Grant NGR-14-005-181)
(NASA-CR-168943; NAS 1.26:168943; UILU-ENG-81-2506; AERONOMY-100) Avail: NTIS HC A11/MF A01 CSCL 04A

The development and first observations of the partial-reflection drifts experiment at Urbana, Illinois (40 N) are described. The winds data from the drifts experiment are compared with electron concentration data obtained by the differential-absorption technique to study the possible meteorological causes of the winter anomaly in the mesosphere at midlatitudes. winds data obtained by the meteor-radar experiment at Urbana are also compared with electron concentration data measured at Urban. A significant correlation is shown is both cases between southward winds and increasing electron concentration measured at the same location during winter. The possibility of stratospheric/mesospheric coupling is investigated by comparing satellite-measured 0.4 mbar geopotential data with mesospheric electron concentration data. No significant coupling was observed. The winds measured at Saskatoon, Saskatchewan (52 N) are compared with the electron concentrations measured at Urban, yielding constant fixed relationship, but significant correlations for short segments of the winter. A significant coherence is observed at discrete frequencies during segments of the winter. R.J.F.

N82-24771*# Illinois Univ., Urbana. Aeronomy Lab.
AN IMPROVED PULSE-HEIGHT ANALYZER FOR ENERGETIC PARTICLE MEASUREMENTS IN THE UPPER ATMOSPHERE
L. Dean and L. G. Smith 1 Feb. 1982 84 p refs
(Grant NGR-14-005-181)
(NASA-CR-168946; NAS 1.26:168946; UILU-ENG-82-2501; AERONOMY-101; ISSN-0568-0581) Avail: NTIS HC A05/MF A01 CSCL 04A

An energetic particle spectrometer for measurements in the upper atmosphere by rocket is described. The system has two methods of processing data. One is a staircase generator using threshold detectors; the other is a peak detector. The system incorporates a logarithmic converter for better resolution at low amplitudes and better use of telemetry channels. The circuits are described and calibration procedures are given. Modifications are recommended for high flux environments. Appendices cover sampling error in the peak detector and modifications made to the receiver of the propagation experiment. S.L.

N82-24772# Science Applications, Inc., McLean, Va.
GEOPHYSICAL PLASMAS AND ATMOSPHERIC MODELING Final Report, 1 Dec. 1980 - 30 Nov. 1981
Ellis Hyman, John Apruzese, Steve Brecht, Winston Chao, James Chen, Richard Chen, Jim Drake, Parves Guzdar, Joseph Hubs, and Richard Lindren Jan. 1982 450 p refs
(Contract N00014-81-C-2038)
(AD-A111632; SAI-82-676-WA) Avail: NTIS HC A19/MF A01 CSCL 04/1

The work performed on this contract encompasses a wide range of topics in space plasma physics and atmospheric modeling in support of the programs of the Geophysical and Plasma Dynamics Branch of the Naval Research Laboratory (NRL). Significant results were obtained in the following areas which will be discussed in succeeding sub-sections below: (1) solar wind-magnetospheric interaction using 2D and 3D MHD computer simulations, (2) investigations of the lower hybrid drift instability, (3) double layer modeling, (4) auroral electron acceleration, (5) ELF/VLF generation in the ionosphere, (6) high altitude nuclear effects, (7) evaluations of atmospheric cooling model, (8) ozone transport, (9) limitations on stratospheric dynamics, (10) general circulation model studies, and (11) collective particle acceleration. GRA

N82-24773# Lincoln Lab., Mass. Inst. of Tech., Lexington. Dept. of Civil Engineering.
STATE-OF-THE-ART FOR ASSESSING EARTHQUAKE HAZARDS IN THE UNITED STATES. REPORT 18: ERRORS IN PROBABILISTIC SEISMIC HAZARD ANALYSIS
Daniele Veneziano Jan. 1982 137 p refs
(Contract DACW39-80-M-2381)
(AD-A110619; MP-S-73-1) Avail: NTIS HC A07/MF A01 CSCL 08/11

After a period of fast development, procedures for the probabilistic quantification of seismic hazard have reached a state of relative maturity. Standard methods usually differ only by secondary characteistics. In spite of this operational stability, estimates of seismic hazard that are produced by different algorithms depend on and are often very sensitive to the form of the mathematical model and the choice of some of the parameters. It is important to recognize this sensitivity in order to avoid placing excessive confidence in numerical estimates of hazard, especially in the case of rare events. Errors may originate from conscious simplification of the mathematical representation (e.g., from the use of a Poisson model of earthquake occurrences as opposed to a physically more attractive point process with spatial and temporal memory), from limited statistical information, or from faulty judgment (expert errors). The purpose of this report is to review different types and sources of errors and to assess their impact on calculated seismic hazard. GRA

N82-24774# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics.
EQUATION OF MOTION FOR THE AXIAL GRAVITATIONAL SUPERFIELD
V. Ogievetsky and E. Sokatshev 1980 16 p refs
(JINR-E-2-80-139) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

Transformation properties of the axial supergravitational field variants are investigated. The equation of motion for the axial gravitational superfield is derived by direct variation of the N = 1 supergravity action. The lift hand side of this equation is a component of the torsion tensor, and the right hand side is the supercurrent. The question about the cosmological term in supergravitity is discussed. DOE

N82-24775# California Univ., Berkeley. Lawrence Berkeley Lab. Earth Sciences Div.
ASSESSMENT OF PRECISE SURFACE-GRAVITY MEASUREMENTS FOR MONITORING THE RESPONSE OF A GEOTHERMAL RESERVOIR TO EXPLOITATION
R. B. Grannell, J. H. Whitcomb, P. S. Aronstam, and R. C. Clover Jun. 1981 112 p refs Prepared in cooperation with California State Univ., Long Beach and Colorado Univ., Boulder

(Contract W-7405-eng-48)
(DE82-003904; LBL-12910; GSRMP-11) Avail: NTIS HC A06/MF A01

Recommendations for carrying out surveys which achieve 15, 10 and 5 microgal precisions are presented. Twenty geothermal areas in the western United States which might be suitable for precise repetitive gravity monitoring were evaluated. The evaluation criteria included capability for subsidence on a geological basis, estimated electrical production, environmental impact, and anticipation of production in the near future. It is felt that the most promising areas in order of priority are: (1) the Salton Sea field, California; (2) Valles Caldera, New Mexico; (3) the Geysers-Clear Lake; and (4) Westmorland, California; (5) Roosevelt Hot Springs, Utah; and (6) Heber, Brawley, and Long Valley, California. DOE

N82-24776# Graz Univ. (Austria). Inst. fuer Nachrichtentechnik und Wellenausbreitung.
FIRST RESULTS OF MEASUREMENTS BY GRAZ UNIVERSITY IN THE ENERGY BUDGET CAMPAIGN
M. Friedrich, W. Riedler, H. Slamanig (Acad. of Sciences, Austria), K. M. Torkar (Acad. of Sciences, Austria), and A. Urban (Acad. of Sciences, Austria) Mar. 1981 26 p refs
(Grant S20-50)
(INW-8103) Avail: NTIS HC A03/MF A01

Wave propagation experiments are described. Faraday rotation and differential absorption were observed by rocket-borne receivers. For the available trajectories, riometer absorption at 37.5 MHz is given. Rocket-borne electrostatic probe measurements (60 to 150 km) are also considered. Electron density and ion density for the different altitudes are graphically depicted. A low energy electron spectrometer was used to establish spatial, angular, and energy distributions of charged particles in the energy range 0.3 to 75 keV. Balloon-borne measurements complement the findings. Author (ESA)

N82-24777# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
PROJECT BIRAMIS: MEASUREMENT OF THE EARTH RADIATION BUDGET BY ACCELEROMETRIC SATELLITE
Anne-Marie Mainguy 1981 95 p refs In FRENCH; ENGLISH summary Sponsored by ESA Report will also be announced as translation (ESA-TT-761)
(ONERA-NT-1981-7; ISSN-0078-3781; ESA-TT-761) Avail: NTIS HC A05/MF A01

The advantages of measuring the Earth radiation budget by capacitive microaccelerometry, such as with the device on board the BIRAMIS satellite, were investigated. The measurement principle is outlined: a spherical satellite, carrying at its center a three-axis accelerometer, detects the acceleration due to all radiation pressures, and thus measures directly the local radiation budget. The various causes of error were analyzed. They result from the operation of the Super-Cactus accelerometer (range: 10 to the minus 10th power to 10 to the minus 6th power m/sec squared), from the characteristics of the satellite coating and from the existence of accelerations of other origins (spurious accelerations). With a view to evaluating the best overall accuracy, two numerical programs were developed, one simulating the measurement, the other estimating the local budget and its associated standard deviation as a function of measuring errors. Results show that an uncertainty < 3 W/sq M can be achieved. Author (ESA)

N82-24778# Woods Hole Oceanographic Institution, Mass.
ST. PETER AND ST. PAULS'S ROCKS (EQUATORIAL ATLANTIC) AND THE SURROUNDING SEA FLOOR
Geoffrey Thompson Nov. 1981 54 p refs
(Grants NSF OCE-77-26842; NSF OCE-80-24930)
(PB82-139403; WHOI-81-98) Avail: NTIS HC A04/MF A01 CSCL 08G

Details on the sampling locations, rock types recovered and bathymetry and morphology of the islets of St. Paul's Rocks (Equatorial Atlantic) and the surrounding sea floor are given. This work was done during cruise 35 of R/V CHAIN, and cruise 20 of R/V ATLANTIS II in 1965. Author (GRA)

N82-24889# Max-Planck-Institut fuer Kernphysik, Heidelberg (West Germany).
COMPOSITION MEASUREMENTS OF STRATOSPHERIC IONS
F. Arnold *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 54-64 refs (For primary document see N82-24880 15-70)
Avail: NTIS HC A16/MF A01

N82-24219# Centre d'Etudes et de Recherches, Toulouse (France).
THE SPACE ENVIRONMENT AND ITS CONSTANTS [L'ENVIRONNEMENT SPATIAL ET SES CONTRAINTES]
J. Berry *In* CNES The Technol. of Spaceborne Sci. Expt. 1981 p 93-122 refs In FRENCH (For primary document see N82-24215 15-12)
Avail: NTIS HC A99/MF A01

N82-24224# Centre National d'Etudes Spatiales, Toulouse (France).
THE UPPER ATMOSPHERE ENVIRONMENT AND BALLOONS [L'ENVIRONNEMENT HAUTE ATMOSPHERE ET LES BALLOONS]
M. Rougeron *In its* The Technol. of Spaceborne Sci. Expts. 1981 p 249-275 In FRENCH (For primary document see N82-24215 15-12)
Avail: NTIS HC A99/MF A01

N82-24890# Max-Planck-Institut fuer Kernphysik, Heidelberg (West Germany).
SILICON NEGATIVE ION CHEMISTRY IN THE ATMOSPHERE: IN SITU AND LABORATORY MEASUREMENTS
A. A. Viggiano, F. Arnold (NOAA, Boulder, Colo.), D. W. Fahey, F. C. Fehsenfeld (NOAA, Boulder, Colo.), and E. E. Ferguson (NOAA, Boulder, Colo.) *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 65-69 (For primary document see N82-24880 15-70)
Avail: NTIS HC A16/MF A01

47 METEOROLOGY AND CLIMATOLOGY

Includes weather forecasting and modification.

N82-24779* National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.
LIGHTNING DISCHARGE IDENTIFICATION SYSTEM Patent
Carl L. Lennon, inventor (to NASA) Issued 9 Jun. 1981 4 p Filed 30 May 1979 Supersedes N79-25313 (17 - 16, p 2121)
(NASA-Case-KSC-11099-1; US-Patent-4,272,720; US-Patent-Appl-SN-043945; US-Patent-Class-324-72; US-Patent-Class-324-77R) Avail: US Patent and Trademark Office CSCL 04B

A system for differentiating between cloud to cloud and cloud to ground lightning discharges is described which includes an electric field antenna that senses the rate of charge of an electric field produced by a lightning discharge. When the signal produced by the electric field exceeds a predetermined threshold, it is fed to a coincidence detector. A VHF antenna is also provided and generates a video signal responsive to a cloud to cloud lightning discharge, and this signal is fed through a level sensor, an inverter, to the coincidence detector simultaneously with the signal from the field detector. When signals from the electric field antenna and the VHF antenna appear at the coincidence detector simultaneously, such indicates that there is a cloud to cloud lightning discharge; whereas, when there is not a signal prouced on the VHF antenna simultaneously with a signal produced by the field sensor, then a strike indicator connected to the coincidence detector indicates a cloud to ground lightning discharge.
Official Gazette of the U.S. Patent and Trademark Office

N82-24780*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

GUIDELINES FOR THE AEROSOL CLIMATIC EFFECTS SPECIAL STUDY: AN ELEMENT OF THE NASA CLIMATE RESEARCH PROGRAM

Feb. 1979 27 p

(NASA-TM-78554; A-7716; NAS 1.15:78554) Avail: NTIS HC A03/MF A01 CSCL 04B

Research to help develop better understanding of the role of aerosols in the Earth's radiative balance is summarized. Natural volcanic injections of aerosols into the stratosphere to understand and model any resultant evidence of climate change are considered. The approach involves: (1) measurements from aircraft, balloon and ground based platforms which complement and enhance the aerosol information derived from satellite data; (2) development of instruments required for some of these measurements; (3) theoretical and laboratory work to aid in interpreting and utilizing space based and in situ data; and (4) preparation for and execution of concentrated observations of stratospheric aerosols following a future large volcanic eruption. M.D.K.

N82-24781*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

METEOROLOGICAL SATELLITES: PAST, PRESENT, AND FUTURE

May 1982 61 p refs Proc. of the Session on Meteorol. Satellites at the AIAA 20th Aerospace Sci. Meeting, Orlando, Fla., 11-14 Jan. 1982

(NASA-CP-2227; NAS 1.55:2227) Avail: NTIS HC A04/MF A01 CSCL 04B

Past developments, accomplishments and future potential of meteorological satellites are discussed. Meteorological satellite design is described in detail. Space platforms and their meteorological applications are discussed. User needs are also discussed. For individual titles, see N82-24782 through N82-24788.

N82-24782*# Systems Applications, Inc., San Rafael, Calif.

THE INITIAL CONCEPTUALIZATION AND DESIGN OF A METEOROLOGICAL SATELLITE

Stanley M. Greenfield *In* NASA. Marshall Space Flight Center Meteorol. Satellites May 1982 p 3-6 refs (For primary document see N82-24781 15-47)

Avail: NTIS HC A04/MF A01 CSCL 04B

The meteorological satellite had its substantive origin in the analytical process that helped initiate America's military satellite program. Its impetus lay in the desire to acquire current meteorological information in large areas for which normal meteorological observational data were not available on a day-to-day basis. Serious consideration was given to the feasibility of reconnaissance from meteorological satellites. The conceptualization of a meteorological satellite is discussed along with the early research which gave substance to that concept. B.W.

N82-24783*# RCA Astro-Electronics Div., Princeton, N. J.

THE DEVELOPMENT OF THE TIROS GLOBAL ENVIRONMENTAL SATELLITE SYSTEM

A. Schnapf *In* NASA. Marshall Space Flight Center Meteorol. Satellites May 1982 p 7-16 (For primary document see N82-24781 15-47)

Avail: NTIS HC A04/MF A01 CSCL 04B

From its very first orbit around the Earth, TIROS demonstrated the ability of the satellite to perform global observations on a timely basis. With the success of TIROS-1, there followed an orderly growth and evolution of the TIROS family of meteorological satellites over the next two decades. The chronology of the TIROS satellites is depicted. A total of 28 TIROS/ESSA/ITOS/(TIROS-N)/NOAA series of satellites was orbited successfully, all meeting or exceeding the mission requirements. The orbital performance of the TIROS satellites is presented. B.W.

N82-24784*# General Electric Co., Fairfield, Conn.

THE NIMBUS SATELLITE SYSTEM: REMOTE SENSING R&D PLATFORM OF THE 70'S

I. S. Haas and R. Shapiro (NASA. Goddard Space Flight Center) *In* NASA. Marshall Space Flight Center Meteorol. Satellites May 1982 p 17-29 (For primary document see N82-24781 15-47)

Avail: NTIS HC A04/MF A01 CSCL 04B

Originally concevied to be the future operational weather satellite, the Nimbus series of seven satellites became the work horse and experimental backbone of the NASA/NOAA space research program. Early problems in developing the attitude control system and proving its operational characteristics in the simulated space environment are discussed. The program proved itself many times over; contributing substantially to the scientific knowledge of atmospherics and weather. As application/research vehicles, the seven Nimbus spacecraft were used for the development, test and application of a variety of new and advanced meteorological and geophysical remote sensing instruments and associated data transmission and processing techniques. B.W.

N82-24785*# Air Force Space Div., Los Angeles, Calif.

DEFENSE METEOROLOGICAL SATELLITE PROGRAM (DMSP)

James W. Rivers, Jr. and Charles P. Arnold, Jr. *In* NASA. Marshall Space Flight Center Meteorol. Satellites May 1982 p 31-34 refs (For primary document see N82-24781 15-47)

Avail: NTIS HC A04/MF A01 CSCL 04B

The Defense Meteorological Satellite Program is a total satellite system composed of spacecraft with meteorological sensors, an Earth-based command and control network, user stations, launch vehicle and support; with a communication network linking the various segments together. The various system segments are described. R.J.F.

N82-24786*# Hughes Aircraft Co., Los Angeles, Calif.

THE DESIGN AND DEVELOPMENT OF GOES

L. R. Fermelia *In* NASA. Marshall Space Flight Center Meteorol. Satellites May 1982 p 35-42 ref (For primary document see N82-24781 15-47)

Avail: NTIS HC A04/MF A01 CSCL 04B

The design and development of the GOES satellites is discussed. The configuration of the satellite and the operation and capabilities of its subsystems are detailed. Spacecraft performance characteristics are given. R.J.F.

N82-24787*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

SPACE PLATFORMS AND METEOROLOGICAL APPLICATIONS

Kenny L. Mitchell and Gregory S. Wilson *In its* Meteorol. Satellites May 1982 p 43-51 refs (For primary document see N82-24781 15-47)

Avail: NTIS HC A04/MF A01 CSCL 04B

An overview of past, current, and future space platform activities, with emphasis on implementation of the initial space platform is presented. Utilization of the space platform for meteorological purposes is examined and shown to be practical for both research and operational payloads. R.J.F.

N82-24788*# National Oceanic and Atmospheric Administration, Washington, D. C. Advanced Systems Concepts Group.

USER NEEDS AND THE FUTURE OF OPERATIONAL METEOROLOGICAL SATELLITES

Donald B. Miller and Joseph R. Silverman *In* NASA. Marshall Space Flight Center Meteorol. Satellites May 1982 p 53-59 (For primary document see N82-24781 15-47)

Avail: NTIS HC A04/MF A01 CSCL 04B

Meteorological satellites and their capabilities are described. Future satellite configurations and instrumentation are discussed in the light of future user needs. In addition to the continuation of existing baseline products and services, the goals for improvement of the geosynchronous system through the 1990's will be: increasing spacial resolution in the visible and infrared channels; increasing vertical mean layer temperature resolution; adding the ability to image the solar disk; and upgrading the ground systems. Other improvements are discussed. R.J.F.

N82-24789*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

NUMERICAL PREDICTION OF THE MID-ATLANTIC STATES CYCLONE OF 18-19 FEBRUARY 1979

Robert Atlas and Robert Rosenberg (Sigma Data Services Corp.) Jan. 1982 58 p refs

(NASA-TM-83922; NAS 1.15:83922) Avail: NTIS HC A04/MF A01 CSCL 04B

A series of forecast experiments was conducted to assess

the accuracy of the GLAS model, and to determine the importance of large scale dynamical processes and diabatic heating to the cyclogenesis. The GLAS model correctly predicted intense coastal cyclogenesis and heavy precipitation. Repeated without surface heat and moisture fluxes, the model failed to predict any cyclone development. An extended range forecast, a forecast from the NMC analysis interpolated to the GLAS grid, and a forecast from the GLAS analysis with the surface moisture flux excluded predicted weak coastal low development. Diabatic heating resulting from oceanic fluxes significantly contributed to the generation of low level cyclonic vorticity and the intensification and slow rate of movement of an upper level ridge over the western Atlantic. As an upper level short wave trough approached this ridge, diabatic heating associated with the release of latent heat intensified, and the gradient of vorticity, vorticity advection and upper level divergence in advance of the trough were greatly increased, providing strong large scale forcing for the surface cyclogenesis. Author

N82-24790*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

POWER SPECTRAL MEASUREMENTS OF CLEAR-AIR TURBULENCE TO LONG WAVELENGTHS FOR ALTITUDES UP TO 14,000 METERS

Harold N. Murrow, William E. McCain, and Richard H. Rhyne Apr. 1982 163 p refs

(NASA-TP-1979; L-14829; NAS 1.60:1979) Avail: NTIS HC A08/MF A01 CSCL 04B

Measurements of three components of clear air atmospheric turbulence were made with an airplane incorporating a special instrumentation system to provide accurate data resolution to wavelengths of approximately 12,500 m (40,000 ft). Flight samplings covered an altitude range from approximately 500 to 14,000 m (1500 to 46,000 ft) in various meteorological conditions. Individual autocorrelation functions and power spectra for the three turbulence components from 43 data runs taken primarily from mountain wave and jet stream encounters are presented. The flight location (Eastern or Western United States), date, time, run length, intensity level (standard deviation), and values of statistical degrees of freedom for each run are provided in tabular form. The data presented should provide adequate information for detailed meteorological correlations. Some time histories which contain predominant low frequency wave motion are also presented. B.W.

N82-24791*# Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.

TROPICAL CYCLONE INTENSITY CHANGE. A QUANTITATIVE FORECASTING SCHEME

Kenneth M. Dropco and W. M. Gray May 1981 94 p refs Sponsored by NASA

(Contract NOAA-NA79-RA-D-00002)

(NASA-CR-168948; NAS 1.26:168948; ATS-333; ISSN-0067-0340) Avail: NTIS HC A05/MF A01 CSCL 04B

One to two day future tropical cyclone intensity change from both a composite and an individual case point-of-view are discussed. Tropical cyclones occurring in the Gulf of Mexico during the period 1957-1977 form the primary data source. Weather charts of the NW Atlantic were initially examined, but few differences were found between intensifying and non-intensifying cyclones. A rawinsonde composite analysis detected composite differences in the 200 mb height fields, the 850 mb temperature fields, the 200 mb zonal wind and the vertical shears of the zonal wind. The individual cyclones which make up the composite study were then separately examined using this composite case knowledge. Similar parameter differences were found in a majority of individual cases. A cyclone intensity change forecast scheme was tested against independent storm cases. Correct predictions of intensification or non-intensification could be made approximately 75% of the time. R.J.F.

N82-24792# Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.

THE ROLE OF THE GENERAL CIRCULATION IN WESTERN PACIFIC TROPICAL CYCLONE GENESIS

Geoff Love Mar. 1982 222 p refs

(Grant NSF ATM-7923591)

(ATS-34; ISSN-0067-0340) Avail: NTIS HC A10/MF A01

The role that large scale circulation patterns play in tropical cyclone genesis is studied. The problem of defining the important flow features observed prior to cylcone genesis in the northwest Pacific and Australian region is addressed. A combination of case study and compositing was used to identify those weather systems which interact with a pregenesis tropical cloud cluster, enhancing its development potential. Energy propagation from the midlatitudes to the deep tropics was found to be dependent upon the scale of the forcing and the background wind field. For Northern Hemisphere midlatitude forcings which are equivalent barotropic in nature, it is possible to generate large amplitude responses in the Southern Hemisphere regardless of the intervening wind fields. An important role of the tropics in all simulations appears to be to provide a region where down the pressure gradient flow may readily occur, assisting in the adjustment processes to planetary scale forcings. R.J.F.

N82-24793# Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.

TROPICAL CYCLONE AND RELATED METEOROLOGICAL DATA SETS AVAILABLE AT CSU AND THEIR UTILIZATION

W. M. Gray, E. Buzzell, and G. Burton Feb. 1982 190 p refs Sponsored by NSF, NOAA, ONR and Navy Environmental Prediction Research Facility

Avail: NTIS HC A09/MF A01

A comprehensive collection of tropical cyclone and other meteorological data is presented. A rationale for the research philosophy behind the assembling of these data sets is provided. The data is described, and the rawinsonde compositing philosophy and the other research techniques employed are summarized. Data processing procedures, the various fomulations used for different research purposes, the coordinate systems employed and the data availability by region is also described. Research accomplishments, types of compositing runs, and a list of publications are also presented. S.L.

N82-24794# Committee on Science and Technology (U. S. House).

CARBON DIOXIDE AND CLIMATE: THE GREENHOUSE EFFECT

Washington GPO 1981 151 p Hearing before the Subcomm. on Nat. Resources, Agr. Res. and Environ. and the Subcomm. on Invest. and Oversight of the Comm. on Sci. and Technol., 97th Congr., 1st Sess., No. 45, 31 Jul. 1981

(GPO-85-496) Avail: Subcommittee on Natural Resources, Agriculture Research and Environment

The far ranging environmental impacts of climatic change resulting from a possible greenhouse effect caused by high concentrations of carbon dioxide in the atmosphere are discussed. Research areas are identified. Past and current research efforts are discussed. The role of energy consumption is assessed. R.J.F.

N82-24795*# Colorado State Univ., Fort Collins. Dept. of Atmospheric Science.

EVALUATION AND DEVELOPMENT OF SATELLITE INFERENCES OF CONVECTIVE STORM INTENSITY USING COMBINED CASE STUDY AND THUNDERSTORM MODEL SIMULATIONS Final Report, 1 May 1979 - 30 Apr. 1982

William R. Cotton and Gregory J. Tripoli Apr. 1982 98 p refs

(Grant NsG-5341; Contract N00014-79-C-0795; Grant NSF ATM-79-08297)

(NASA-CR-168964; NAS 1.26:168964) Avail: NTIS HC A05/MF A01 CSCL 04B

Observational requirements for predicting convective storm development and intensity as suggested by recent numerical experiments are examined. Recent 3D numerical experiments are interpreted with regard to the relationship between overshooting tops and surface wind gusts. The development of software for emulating satellite inferred cloud properties using 3D cloud model predicted data and the simulation of Heymsfield (1981) Northern Illinois storm are described as well as the development of a conceptual/semi-quantitative model of eastward propagating, mesoscale convective complexes forming to the lee of the Rocky Mountains. A.R.H.

N82-24796# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
THE DISTRIBUTION OF WIND VELOCITIES IN POLAND AT HEIGHTS 10 AND 25 M ABOVE GROUND LEVEL
Zenon Wierzbicki 5 Feb. 1982 24 p refs Transl. into ENGLISH from Pr. Panstwowego Inst. Hydrol.-Meteorol. (Poland), no. 93, 1968 p 63-75
(AD-A111433; FTD-ID(RS)T-1714-81) Avail: NTIS HC A02/MF A01 CSCL 04/2

Three zones of wind velocity (strong, average, and weak) were distinguished at 10 and 25 meters above ground level in Poland. The reduction of wind velocities at these levels was carried out by means of a formula which takes into account the turbulence in the friction layer and the roughness of the ground base. Author

N82-24797# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
EXPEDITIONARY WORKS ON THE STUDY OF THE CLOUDS OF THE CRIMEAN COAST OF THE BLACK SEA
A. F. Dyubyuk 2 Feb. 1982 22 p Transl. into ENGLISH of conf. paper presented at the Mezhduvedomstvennaia Konf. po Voprosam Issled., Osakdovi Grozovoso Eltrichestva 6th (USSR), 1961 p 303-317 Conf. held in Moscow, 15-19 Jun. 1959
(AD-A111407; FTD-ID(RS)T-1656-81) Avail: NTIS HC A02/MF A01 CSCL 04/2

Parallel with the regular meteorological and the more limited radio sounding observations of clouds, the employment of photographic methods of observation is discussed. The recording of the cloud shapes and their location was carried out by photographing by hand with a camera of the FED type. Panoramic and repetitive photography gave the pattern of the location of the clouds and their development in time. Photogrammetric photography used a base line of the order of 1,000 m. Cloud photographs are presented for various types of formations. T.M.

N82-24798# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
DISTRIBUTION AND FREQUENCY OF DIRECTION OF GROUND AIR CURRENTS IN THE POLISH TATRA MOUNTAINS
Janina Lewinska 15 Jan. 1982 58 p refs Transl. into ENGLISH from Wiad. Sluzby Hydrol. Meteorol. (Poland), v. 6, no. 6, 1959 p 239-252
(AD-A111159; FTD-ID(RS)T-1592-81) Avail: NTIS HC A04/MF A01 CSCL 04/2

The meteorological factor wind, which is of importance in town planning is discussed. Meteorological and geographic factors in environmental and economic planning are considered. It is proposed that economic planning should be based on a combination of meteorological and geographic studies. Mountainous areas create conditions for the flow of air masses. Divergence, spreading of air streams, as a result of broadening of orographic forms results in reduction of wind velocity. Turbulence or convection caused by local disturbances of thermal equilibrium is examined. Anemometers were used to measure wind direction frequency and wind velocity frequency at three different altitude levels. It is found that: (1) terrain orography influences prevailing direction, and wind velocity; (2) directions of prevailing winds agree with the course of valley, bowls and passes; (3) only small seasonal changes occur in the frequency of wind directions; and (4) wind velocity increases with altitude. E.A.K.

N82-24799# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
MAXIMUM WIND VELOCITY, WITH DIFFERENT PROBABILITIES OF OCCURRENCE, IN A CLEARED MOUNTAINOUS ZONE OF THE ROMANIAN CARPATHIANS
O. Neacsa, C. Popovici, A. Sabau, D. Radu, and V. Susan 14 Jan. 1982 9 p refs Transl. into ENGLISH from Hidrotehnica (Romania), v. 18, no. 11, 1973 p 590-591
(AD-A110607; FTD-ID(RS)T-1659-81) Avail: NTIS HC A02/MF A01 CSCL 04/2

A chart is given showing maximum values, averaged for two minutes, for wind velocities with different probabilities of occurrence. Another chart shows variation in relation to altitude for maximum values (averaged over two minutes) of wind velocities with different probabilities of occurrence. R.J.F.

N82-24800# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ASSERTION OF A CENTRAL EUROPEAN SINGULARITY IN THE AREA OF YUGOSLAVIA
Danilo Furlan 19 Jan. 1982 20 p refs Transl. into ENGLISH from Sourcr Geografski Vestnik, Ljublijana (Yugoslavia), v. 31, 1939 p 121-130
(AD-A110597; FTD-ID(RS)T-1642-81) Avail: NTIS HC A02/MF A01 CSCL 04/2

The singularities connecting daily average temperature over the period of 1947 to 1956 were analyzed for meteorological stations in Yugoslavia. The stations are located in climatologically different regions, however, the connecting lines at the three stations show a consistent temperature progression. The central European singularity is expressed in the southeastern part of Yugoslavia as well. Atmospheric circulation in central Europe, the North Atlantic, and the Mediterranean are examined. Dynamic and statistical climatological methods are compared. E.A.K.

N82-24801# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
CONCERNING THE CONCEPT OF THE CENTRAL MOUNTAIN FOEHN
H. G. Koch 19 Jan. 1982 42 p refs Transl. into ENGLISH from Z. fuer Meteorol. (West Germany), no. 14, 1960 p 29-46
(AD-A110648; FTD-ID(RS)T-1661-81) Avail: NTIS HC A03/MF A01 CSCL 04/2

Extreme values and thermograph recordings of pairs of stations located at equal altitude on the windward and leeward side of the Thuringian Forest are evaluated. The annual variation of the southwest foehn is shown to be related to the frequency of westerly weather conditions. Furthermore, the existence of a northeast foehn is revealed. It is proposed to use the temperature and humidity differences of both mountain sides as a criteria for determining the foehn of the Central Mountains. R.J.F.

N82-24802# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
SOME CHARACTERISTICS OF SEA BREEZE CIRCULATION THROUGHOUT THE BLACK SEA ZONE
Gheorge Bizic 19 Jan. 1982 23 p refs Transl. into ENGLISH from Hidrotehnica (Romania), v. 17, no. 11, Nov. 1972 p 605-613
(AD-A110599; FTD-ID(RS)T-1658-81) Avail: NTIS HC A02/MF A01 CSCL 04/2

Some characteristics of Sea Breeze Circulation Throughout the Black Sea Zone--Translation. GRA

N82-24803# Physics Lab. RVO-TNO, The Hague (Netherlands). Research Group 1: Physics.
AEROSOL MEASUREMENTS ON THE NORTH SEA: 22 SEPTEMBER TO 4 OCTOBER 1980
J. W. H. Dielis Apr. 1981 39 p refs
(PHL-1981-16; TDCK-75342) Avail: NTIS HC A03/MF A01

Aerosol size distribution, visibility, wind direction and velocity, relative humidity, and sea state data are presented. Extinction and backscatter coefficients were calculated for coastal, open sea, and marine fog aerosols, using Mie theory. Coastal areas show a Junge distribution of particle density with a broad particle size spectrum. Volume distributions of open sea aerosols indicate the presence of large sea spray aerosols in a background distribution of small continental particles. The marine fog aerosol volume distribution function peaks at 1.5 micron particle diameter. Open sea extinction coefficients are small for wavelengths < micron. Backscatter coefficients are greatest at wavelengths between 1 and 4 microns. Author (ESA)

48 OCEANOGRAPHY

Includes biological, dynamic and physical oceanography; and marine resources.

N82-24804 British Library Lending Div., Boston Spa (England).
[GEOCHEMICAL INVESTIGATION INTO SEAWATER AND MANGANESE NODULES FROM AN AREA IN THE CENTRAL

PACIFIC OCEAN] Ph.D. Thesis - Aachen Univ., 1976
R. Z. Roncal [1981] 6 p refs Transl. into ENGLISH from German dissertation
(BLL-RTS-12435A) Avail: British Library Lending Div., Boston Spa, Engl.

The Mn, Fe, Co, Ni and Cu contents of surface water, deep water and pore water samples from an area in the Central Pacific were investigated. The analytical data were interpreted with the help of thermodynamic calculations to provide information on the possible heavy metal compounds present in seawater. The relationships between the elements Co, Ni and Cu and the Mn and Fe phases were determined by means of chemical and mineralogical investigations into synthetic Mn and Fe hydroxides and manganese nodules from the same area. An extraction technique was used to determine the trace elements which occur in low concentrations. The technique was modified to provide almost complete extraction of heavy metals. M.D.K.

N82-24805# National Oceanic and Atmospheric Administration, Boulder, Colo. Wave Propagation Lab.
CIRCULATION AND TRAJECTORY CALCULATIONS IN THE EASTERN STRAIT OF JAUN DE FUCA USING A CODAR SYSTEM
A. S. Frisch and B. L. Weber May 1981 29 p refs
(PB82-134099; EPA-600/7-81-089) Avail: NTIS HC A03/MF A01 CSCL 08C

During the summer of 1978 and 1979, the surface currents of the Eastern Strait of Juan de Fuca were mapped with a high frequency radar system. This system measures surface currents over several hundred square kilometers. In this study, the authors have used data from both years to make a composite picture of the tidal flow over an area covered by the radar in all the experiments. In addition, because of the potential impact from an oil leak along the path of a proposed oil pipeline, the authors have simulated a continuous release of a material and computed a trajectory for a no-wind condition. GRA

51 LIFE SCIENCES (GENERAL)

Includes genetics.

N82-24806 Joint Publications Research Service, Arlington, Va.
USSR REPORT. LIFE SCIENCES: BIOMEDICAL AND BEHAVIORAL SCIENCES, NO. 14
28 Jan. 1982 89 p refs Transl. into ENGLISH from various Russian articles
(JPRS-79973) Copyright. Avail: Issuing Activity

Changes in central nervous system cells caused by the reproduction of arboviruses, pigskin grafts for burn treatment, the role of aviation physicians, the use of magnetic fields in biology and medicine, and cellular processes observed in the recovery from acute radiation sickness are discussed. For individual titles, see N82-24807 through N82-24811.

N82-24807 Joint Publications Research Service, Arlington, Va. **c52**
ULTRASTRUCTURAL CHANGES IN CENTRAL NERVOUS SYSTEM CELLS INDUCED BY ARBOVIRUSES
B. A. Yerman and N. Ya. Pashnina *In its* USSR Rept. Life Sci.: Biomed. and Behavioral Sci., No. 14 (JPRS-79973) 28 Jan. 1982 p 1-11 refs Transl. into ENGLISH from Arkh. Patol. (USSR), v. 43, no. 9, Sep. 1981 p 72-78 (For primary document see N82-24806 15-51)
Copyright. Avail: Issuing Activity

Changes observed in animal central nervous system cells due to the reproduction of tick-borne encephalitis arboviruses are described. The disappearance of the rough endoplasmic reticulum, cellular ribosomes, and polysomes in nerve and glial cells, and hyperplasia and hypertrophy of the smooth membranes of the lamellar complex and endoplasmic reticulum with dilatation of cisternae and canals was observed. The grouping of smooth membranes and the appearance on the membranes of nucleoid centers are characteristic. The appearance of vesicles in the cytoplasmic matrix and cisternae of endoplasmic reticulum was observed. Sites where mature virions and alphavirus and flavivirus nucleoids are located and identified. Other changes typical for each pathogen are described. J.D.

N82-24808 Joint Publications Research Service, Arlington, Va. **c52**
PIGSKIN XENOGRAFTS IN TREATMENT OF PATIENTS WITH EXTENSIVE BURNS
V. K. Sologub, M. I. Dolgina, D. A. Donetskiy, S. S. Morozov, V. G. Borisov, Z. G. Goncharova, and G. G. Serov *In its* USSR Rept. Life Sci.: Biomed. and Behavioral Sci., No. 14 (JPRS-79973) 28 Jan. 1982 p 36-39 refs Transl. into ENGLISH from Khirurgiya (Moscow), no. 5, May 1980 p 14-16 (For primary document see N82-24806 15-51)
Copyright. Avail: Issuing Activity

The use of pigskin xenografts for the treatment of severe burns is evaluated. Clinical observations of the treatment of 60 patients having deep burns over 10 to 70% of their bodies are described. The burns were covered with preserved skin grafts of both allogenic and xenogenic origin. An improvement in neurological and psychological status, the reduction of heat, water, protein, and electrolyte losses, and the prevention of anemia and of microfloral invasion of the wound and were observed. J.D.

N82-24809 Joint Publications Research Service, Arlington, Va. **c52**
SUPPORT ROLE OF AVIATION PHYSICIANS
I. Alpatov *In its* USSR Rept. Life Sci.: Biomed. and Behavioral Sci., No. 14 (JPRS-79973) 28 Jan. 1982 p 40-42 Transl. into ENGLISH from Grazhdanskaya Aviats. (Moscow), no. 6, Jun. 1981 p 24 (For primary document see N82-24806 15-51)
Copyright. Avail: Issuing Activity

The changing role of aviation physicians in maintaining and evaluating the health of flight personnel is discussed, with particular emphasis on the sociopsychological aspects of health care. J.D.

N82-24810 Joint Publications Research Service, Arlington, Va.
BIOTROPIC PARAMETERS OF MAGNETIC FIELDS
M. A. Shishlo *In its* USSR Rept. Life Sci.: Biomed. and Behavioral Sci., No. 14 (JPRS-79973) 28 Jan. 1982 p 47-50 refs Transl. into ENGLISH from Vopr. Kurortol., Fizioterapii i Lecheb. Fiz. Kult. (Moscow), no. 3, May - Jun. 1981 p 61-63 (For primary document see N82-24806 15-51)
Copyright. Avail: Issuing Activity

The use of magnetic fields in biology and medicine for the control of biological systems is discussed. Biotropic parameters of magnetic fields, including intensity, gradient, vector, pulse frequency and shape, and duration of exposure are described. Units of measurement are given, and terminology is discussed. J.D.

N82-24811 Joint Publications Research Service, Arlington, Va. **c52**
POSTRADIATION RECOVERY OF HUMAN BONE MARROW AND MORPHOLOGICAL DYNAMICS OF UNDIFFERENTIATED CELL POOL
L. A. Suvorova, N. A. Vyalova, A. V. Barabanoya, and G. P. Gruzdev *In its* USSR Rept. Life Sci.: Biomed. and Behavioral Sci., No. 14 (JPRS-79973) 28 Jan. 1982 p 55-62 refs Transl. into ENGLISH from Terapevt. Arkh. (Moscow), v. 53, no. 9, Sep. 1981 p 127-131 (For primary document see N82-24806 15-51)
Copyright. Avail: Issuing Activity

The postradiation repair of the hemopoietic function in human beings and of changes observed in bone marrow and peripheral blood is described. The processes of damage and recovery of bone marrow from acute radiation sickness induced by external radiation are described, based on observations of 77 samples made from the first to the forty-third day after irradiation. J.D.

N82-24812*# California Univ., Irvine. Dept. of Development and Cell Biology.
DEVELOPMENT OF GUAYULE (PARTHENIUM ARGENTATUM) Final Report
Ernest A. Ball 2 Jan. 1981 14 p refs
(Contracts NAS7-100; JPL-954955)
(NASA-CR-168926; JPL-9950-477; NAS 1.26:168926; UCI-59913) Avail: NTIS HC A02/MF A01 CSCL 06C

The cytokinin benzylaminopurine strongly stimulated shoot growth, and the number of regenerated buds on the inoculum was proportional to its concentration. These buds produced shoots several centimeters in length which were caused to root on medium containing indolebutyric acid. Transferred to the septic

condition of soil, the plantlets were gradually brought into full sunlight where they showed a brief vegetative growth with production of mature type leaves, and flowered. In contrast, seedlings of the same age remained vegetative. Chromosome studies of root smears from the tissue cultured plantlets showed that 2n = 36, the normal number for sexually reproducing guayules. Author

N82-24813# Committee on Science and Technology (U. S. House).

THE USE OF ANIMALS IN MEDICAL RESEARCH AND TESTING

Washington GPO 1982 752 p refs Hearings before the Subcomm. on Sci., Res. and Technol. of the Comm. on Sci. and Technol., 97th Congr., 1st Sess., No. 68, 13-14 Oct. 1981 (GPO-87-598) Avail: Subcommittee on Science, Research and Technology

The use of animals in medical research is discussed. Abundant evidence is cited for the view that the research involving animals is beneficial for humans. Other evidence is presented that supports the view that alternative research methods could be employed. Criticism is aimed at the poor care that the animals receive and at the unnecessary suffering they experience. The ethics and morals of animal experimentation are considered. The text of House Resolution 556, a pending bill calling for the establishment of a national center for alternative research is given. R.J.F.

N82-24814# Medical Biological Lab. RVO-TNO, Rijswijk (Netherlands).

EVALUATION OF IMMUNOLOGICAL METHODS FOR TOXICITY STUDIES IN ANIMALS: INHALATION STUDIES WITH BENZENE AND HALOTHANE IN RATS

L. M. Appelman (Inst. Toxicology and Nutrition, Utrecht), O. Brocades Zaalberg, J. L. F. Gerbrandy, Frieke Kuper, and D. deRijke (Inst. Toxicology and Nutrition, Utrecht) Mar. 1980 127 p refs

(MBL-1980-4; CIVO-R-6506; TDCK-75132) Avail: NTIS HC A07/MF A01

The sensitivity of the immune system as a criterion for detecting harmfulness of inhaled substances was investigated. Immunological and toxicological data from tests in which rats were exposed to benzene and halothene for six weeks are recorded. For individual titles, see N82-24815 through N82-24818.

N82-24815# Medical Biological Lab. RVO-TNO, Rijswijk (Netherlands).

INHALATION STUDIES WITH BENZENE IN RATS. PART A: TOXICOLOGICAL DATA

L. M. Appelman, C. F. Kuper, and D. deRijke *In its* Evaluation of Immunol. Methods for Toxicity Studies in Animals: Inhalation Studies with Benzene anu Halothane in Rats Mar. 1980 73 p refs (For primary document see N82-24814 15-51)

Avail: NTIS HC A07/MF A01

Subchronic benzene inhalation toxicity was studied by exposing groups of 15 male and 15 female rats to atmospheres containing 0, 25, 250 or 1250 ppm benzene, 6 hr a day, 5 days a week, for 13 weeks. Five males and five females of each group were killed after 6 weeks for interim pathological examination. Two groups of female rats were exposed to 0 or 250 ppm benzene for a period of 6 weeks. Examination shows that benzene concentrations of 1250 or 250 ppm in the atmosphere can induce lymphopenia accompanied by reduced thymus and spleen weights. The no-toxic-effect level of benzene in rats is 25 ppm. Author (ESA)

N82-24816# Medical Biological Lab. RVO-TNO, Rijswijk (Netherlands).

INHALATION STUDIES WITH BENZENE IN RATS. PART B: IMMUNOLOGICAL DATA

O. Brocades Zaalberg and J. L. F. Gerbrandy *In its* Evaluation of Immunol. Methods for Toxicity Studies in Animals: Inhalation Studies with Benzene and Halothane in Rats Mar. 1980 26 p refs (For primary document see N82-24814 15-51)

Avail: NTIS HC A07/MF A01

Subchronic benzene inhalation toxicity was studied. In experiments (1) and (2), male and female rats were exposed to 0, 25, 250, and 1250 ppm benzene vapor for 6 hr a day, 5 days a week for 13 weeks. In experiment (3), female rats were exposed to 250 ppm for 6 weeks. Primary antibody formation against sheep red blood cells (SRBC) in (1) varies too much to justify conclusions about a benzene effect. The antibody response to SRBC by the test rats in (3) is the same as that of the controls. Mitogen stimulation of spleen cells and peripheral blood cells shows a linear log benzene dose effect relation with phytohemagglutinin (PHA) stimulated male and female spleen cells in (1), and with PHA, Concanavalin A or PWM stimulated peripheral blood cells in (2). In (3), a significant reduction in PHA stimulation of peripheral blood cells from test rats is observed. Author (ESA)

N82-24817# Medical Biological Lab. RVO-TNO, Rijswijk (Netherlands).

INHALATION STUDIES WITH HALOTHANE IN FEMALE RATS. PART A: TOXICOLOGICAL DATA

L. M. Appelman and C. F. Kuper *In its* Evaluation of Immunol. Methods for Toxicity Studies in Animals: Inhalation Studies with Benzene and Halothane in Rats Mar. 1980 17 p refs (For primary document see N82-24814 15-51)

Avail: NTIS HC A07/MF A01

Halothane inhalation toxicity was studied by exposing female rats for 6 hr a day, 5 days a week to atmospheres containing 0 or 2500 ppm halothane, for 6 weeks. Mean concentration of the test compound in the atmosphere was 2506 ppm. Inhalation causes growth retardation lymphopenia and slight anemia. More urine of lower density and containing more ketones is produced. Lower glucose and higher urea nitrogen levels in the blood are observed. Higher serum alkaline phosphatase activity is noted. Higher relative liver and kidney weights and a lower relative spleen weight are recorded. Author (ESA)

N82-24818# Medical Biological Lab. RVO-TNO, Rijswijk (Netherlands).

INHALATION STUDY WITH HALOTHANE IN FEMALE RATS. PART B: IMMUNOLOGICAL DATA

O. Brocades Zaalberg and J. L. F. Gerbrandy *In its* Evaluation of Immunol. Methods for Toxicity Studies in Animals: Inhalation Studies with Benzene and Halothane in Rats Mar. 1980 10 p refs (For primary document see N82-24814 15-51)

Avail: NTIS HC A07/MF A01

The effect of exposure to halothane vapor on immunological parameters was studied by exposing female rats to 2500 ppm halothane a day, 5 days a week for 6 weeks. No effect on the primary antibody response to sheep erythrocytes is observed. The secondary antibody response to tetanus toxoid is slightly, but not significantly, lowered as is the delayed hypersensitivity reaction to tuberculin. The local antibody production to tetanus toxoid in the lung is not changed. The transformation reaction of peripheral blood lymphocytes with phytohemagglutinin or concanavalin A is slightly, but not significantly reduced. Author (ESA)

N82-24819# Joint Publications Research Service, Arlington, Va.

USSR REPORT. LIFE SCIENCES: EFFECTS OF NONIONIZING ELECTROMAGNETIC RADIATION, NO. 5

8 Apr. 1982 18 p refs Transl. into ENGLISH from various Russian articles

(JPRS-80525) Copyright. Avail: NTIS HC A02/MF A01

The biological effects of magnetic fields are reported. The cerebral cortex of rats was studied. Metabolic changes in rats are reported. Ion metabolism in blood and myocardium of rats and guinea pigs was also investigated. For individual titles, see N82-24820 through N82-24822.

N82-24820# Joint Publications Research Service, Arlington, Va.

PATHOMORPHOLOGICAL REACTIONS OF CEREBROCORTICAL NEURAL ELEMENTS TO ALTERNATING MAGNETIC FIELD **c52**

I. V. Toroptsev and L. P. Soldatova *In its* USSR Rept. Life Sci.: Effects of Nonionizing Electromagnetic Radiation, No. 5 (JPRS-80525) 8 Apr. 1982 p 1-4 refs Transl. into ENGLISH from Arkh. Patol. (Moscow), v. 43, No. 11, Nov. 1981 p 33-36 (For primary document see N82-24819 15-51)

Copyright. Avail: NTIS HC A02/MF A01

The cerebral cortex was studied as a model highly sensitive

to magnetic fields. Significant disturbances in the water-electrolyte balance, manifested as hydropic changes in the walls of cortical capillaries, nerve cells and their derivatives were discovered. A horseshoe electromagnet with trapezoidal tips at the poles was used to create an alternating magnetic field with a frequency of 50 Hz, which deviated by no more than 5 percent over the entire area of the magnet at a field intensity of 20 mT. The field gradient was 0.1 mT/cm. Intensity pulsation was 1.8 percent. One-time total exposures lasting 6.5 hours were employed. The experiments were run in winter on 136 male rats weighing 190-210 gm. The animals (three specimens in each experiment) were maintained unrestrained in a nonmagnetic cage which limited mobility somewhat. They were killed by decapitation after 1, 6, 12 and 24 hours and 3, 5, 7, 14, 21 and 28 days following exposure. Portions of the parietal, posterior frontal and limbic cortex were sampled as morphological equivalents of, correspondingly, the sensomtor, kinesthetic and motor analyzers and the analyzer of the internal environment. Author

N82-24821# Joint Publications Research Service, Arlington, Va.

METABOLIC CHANGES IN EXPERIMENTAL ANIMALS AS INDICATORS OF BIOLOGICAL EFFECTS OF 50 Hz ELECTROMAGNETIC FIELDS

L. A. Tomashevskaya and Yu. D. Dumanskiy *In its* USSR Rept. Life Sci.: Effects of Nonionizing Electromagnetic Radiation, No. 5 (JPRS-80525) 8 Apr. 1982 p 5-8 refs Transl. into ENGLISH from Vrachebnoye Delo (Kiev), no. 7, Jul. 1981 p 98-100 (For primary document see N82-24819 15-51)
Copyright. Avail: NTIS HC A02/MF A01

The biological effects of commercial frequency (CF) electromagnetic fields (EMF) as a function of intensity and time of exposure to the field are discussed. Conditions proceeding from those that actually prevail in areas where high-voltage lines pass were simulated. A chronic experiment was conucted on white rats (180 specimens) divided into groups according to intensity (E-10, 15, 20 kV/m) and modes of exposure to CF EMF (4 and 16 times a day, 5 min per session, to a total of 20 and 80 min). Biochemical processes were evaluated according to different types of metabolism participating in the body's response to CF EMF. For this purpose, we assayed urea and residual nitrogen in blood serum, blood glucose, liver glycogen, adrenal ascorbic acid, cholinesterase activity, ceruloplasmin content and saturation with transferring iron of blood serum. Studies were conducted during exposure to the field for 4 months, as well as in the aftereffect period. Author

N82-24822# Joint Publications Research Service, Arlington, Va.

EFFECTS OF EXPERIMENTAL STATIONARY MAGNETIC FIELD ON METABOLISM OF SOME IONS IN BLOOD AND MYOCARDIUM

D. D. Tvildiani, T. I. Chlaidze, N. V. Dolidze, L. N. Golashvili, and V. A. Chikhladze *In its* USSR Rept. Life Sci.: Effects of Nonionizing Electromagnetic Radiation, No. 5 (JPRS-80525) 8 Apr. 1982 p 8-11 refs Transl. into ENGLISH from Soobshch. Akad. Nauk Gruz. SSR (USSR), v. 101, no. 1, Jan. 1981 p 169-172 (For primary document see N82-24819 15-51)
Copyright. Avail: NTIS HC A02/MF A01

The effects of a stationary magnetic field (SMF) on EKG parameters and ion (Na, K, Ca, Mg) metabolism in blood serum and myocardial homogenate were studied. The study was conducted on 30 rabbits and 30 guinea pigs. Three-hour exposure of rabbits to SMF elicited a shift of the S-T segment on the EKG, depression of T wave, change in amplitudes of R and S waves in different directions, and after 24 and 48 h a drop of general volage as well. Thirteen out of fifteen healthy rabbits expired on the 2nd or 3rd day after the last exposure to SMF. Conclusions are presented. N.W.

52 AEROSPACE MEDICINE

Includes physiological factors, biological effects of radiation; and weightlessness.

N82-24823# Aerospace Medical Research Labs., Wright-Patterson AFB, Ohio.

TORSO EXPERIENCED AERODYNAMIC FORCES EXPERIENCED DURING EJECTION

Arthur J. Nestle Feb. 1981 48 p refs
(AD-A098942; AFAMRL-TR-80-20) Avail: NTIS HC A04/MF A01 CSCL 06/19

The forces are momentarily unique in direction and can be of severe magnitude. One difficulty of analyzing extremity injury during emergency escape is the diversity and intensity of the aerodynamic environment the human torso experiences entering free stream flow. Aerodynamically, an appreciation of these forces, which can be resolved into positive and negative pressure locally, can be achieved from correlation of the relative likeness of anatomical segments to investigated geometric shapes (i.e., spheres, cylinders, etc.). Aerodynamic data were obtained from tests using modelled crewmembers in a five foot wind tunnel and coefficients of pressure calculated from manometer readings. These coefficients were determined for crewmember location and pitch, and yaw of trim of the aircraft from -10 to +10 degrees each, and were graphically analyzed using three dimensional computer plots. Severity, gross kinetic changes, and points of force application are described. T.M.

N82-24824# Medical Biological Lab. RVO-TNO, Rijswijk (Netherlands).

PROBLEMS IN THE THERAPY OF SOMAN POISONING

O. L. Wolthuis, F. Berends, and E. Meeter Apr. 1981 27 p refs
(Contract A79/K/032)
(MBL-1981-1; TDCK-75106) Avail: NTIS HC A03/MF A01

The lack of efficacy of combined therapies, involving a cholinolytic drug and an oxime, is reviewed. Problems include rapid aging of the phosphylated acetylcholinesterase, poor reactivation of nonaged inhibited enzymes (oxime resistancy), and the predominant effect of soman on the central nervous system. Species differences and the persistence of soman in depots complicate treatment. Reactivation of only a few percent of the total amount of functional cholinesterase can save life, so enzyme aging is not serious. Oxime resistance is overcome by oximes which effectively penetrate the blood brain barrier. These oximes also have antidotal effects not based on enzyme reactivation.
Author (ESA)

N82-24825# Institute for Perception RVO-TNO, Soesterberg (Netherlands). Audiology Group.

EFFECTS OF IMPULSE NOISE ON HUMAN BEINGS: A PILOT STUDY ON ANNOYANCE RATINGS IN THE LABORATORY

G. F. Smoorenburg and W. H. deVries May 1981 53 p refs
(IZF-1981-9; TDCK-75523) Avail: NTIS HC A04/MF A01

Annoyance ratings for traffic, gunfire, pile driving and white noise were recorded by young male adults on a numerical scale. The noises were presented at 49, 56, 63, and 70 dbA for 5 min. Results show no significant differences in ratings for the noises, but when results are combined with those of other researchers, significant interaction between the effects of different levels and of different noises is found. At 63 dbA, ratings for traffic, gunfire and pile driving noise are about the same, but at 49 dbA gunfire and pile driving noise are rated more annoying than traffic noise. The white noise bursts are rated higher than gunfire and pile driving noise. Author (ESA)

N82-24807 Joint Publications Research Service, Arlington, Va.

ULTRASTRUCTURAL CHANGES IN CENTRAL NERVOUS SYSTEM CELLS INDUCED BY ARBOVIRUSES

B. A. Yerman and N. Ya. Pashnina *In its* USSR Rept. Life Sci.: Biomed. and Behavioral Sci., No. 14 (JPRS-79973) 28 Jan. 1982 p 1-11 refs Transl. into ENGLISH from Arkh. Patol. (USSR), v. 43, no. 9, Sep. 1981 p 72-78 (For primary document see N82-24806 15-51)
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N82-24808 Joint Publications Research Service, Arlington, Va.

PIGSKIN XENOGRAFTS IN TREATMENT OF PATIENTS WITH EXTENSIVE BURNS

V. K. Sologub, M. I. Dolgina, D. A. Donetskiy, S. S. Morozov,

V. G. Borisov, Z. G. Goncharova, and G. G. Serov *In its* USSR Rept. Life Sci.: Biomed. and Behavioral Sci., No. 14 (JPRS-79973) 28 Jan. 1982 p 36-39 refs Transl. into ENGLISH from Khirurgiya (Moscow), no. 5, May 1980 p 14-16 (For primary document see N82-24806 15-51)
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N82-24809 Joint Publications Research Service, Arlington, Va.
SUPPORT ROLE OF AVIATION PHYSICIANS
I. Alpatov *In its* USSR Rept. Life Sci.: Biomed. and Behavioral Sci., No. 14 (JPRS-79973) 28 Jan. 1982 p 40-42 Transl. into ENGLISH from Grazhdanskaya Aviats. (Moscow), no. 6, Jun. 1981 p 24 (For primary document see N82-24806 15-51)
Copyright. Avail: Issuing Activity

N82-24811 Joint Publications Research Service, Arlington, Va.
POSTRADIATION RECOVERY OF HUMAN BONE MARROW AND MORPHOLOGICAL DYNAMICS OF UNDIFFERENTIATED CELL POOL
L. A. Suvorova, N. A. Vyalova, A. V. Barabanoya, and G. P. Gruzdev *In its* USSR Rept. Life Sci.: Biomed. and Behavioral Sci., No. 14 (JPRS-79973) 28 Jan. 1982 p 55-62 refs Transl. into ENGLISH from Terapevt. Arkh. (Moscow), v. 53, no. 9, Sep. 1981 p 127-131 (For primary document see N82-24806 15-51)
Copyright. Avail: Issuing Activity

N82-24820# Joint Publications Research Service, Arlington, Va.
PATHOMORPHOLOGICAL REACTIONS OF CEREBROCORTICAL NEURAL ELEMENTS TO ALTERNATING MAGNETIC FIELD
I. V. Toroptsev and L. P. Soldatova *In its* USSR Rept. Life Sci.: Effects of Nonionizing Electromagnetic Radiation, No. 5 (JPRS-80525) 8 Apr. 1982 p 1-4 refs Transl. into ENGLISH from Arkh. Patol. (Moscow), v. 43, No. 11, Nov. 1981 p 33-36 (For primary document see N82-24819 15-51)
Copyright. Avail: NTIS HC A02/MF A01

53 BEHAVIORAL SCIENCES

Includes psychological factors; individual and group behavior; crew training and evaluation; and psychiatric research.

N82-24826# Washington Univ., Seattle. Dept. of Psychology.
INDIVIDUAL DIFFERENCES IN DUAL TASK PERFORMANCE Final Report, 1 Apr. 1977 - 31 Mar. 1980
Marcy Lansman and Earl Hunt 10 Jun. 1981 35 p refs
(Contract N00014-77-C-0225)
(AD-A110768) Avail: NTIS HC A03/MF A01 CSCL 05/10

The topic of the research was individual differences in dual task performance. It addressed the basic question: Is performance on multi-component tasks predicted by performance on the individual components performed separately? In the first series of experiments, we used a dual task involving memory and verbal processing components to predict a psychometric measure of verbal ability. Single and dual task performance were found to be highly correlated. The two types of measures predicted performance on the criterion verbal ability measure equally well. GRA

N82-24827# Illinois Univ., Champaign. Cognitive Psychophysiology Lab.
THE EVENT RELATED BRAIN POTENTIAL AS AN INDEX OF INFORMATION PROCESSING, COGNITIVE ACTIVITY, AND SKILL ACQUISITION: A PROGRAM BASIC RESEARCH Annual Report
Emanuel Donchin and Christopher Wickens Nov. 1981 62 p refs
(Contract F49620-79-C-0233; AF Proj. 2313)
(AD-A111057; CPL81-1/AFO; SR81-1; AFOSR-82-0042TR) Avail: NTIS HC A04/MF A01 CSCL 05/10

This report describes experiments and developments related to six basic categories of research on the event-related brain potential, performance, and cognition: (1) Tracking, attention, and workload; (2) automation, skill learning, memory, and the 'depth' of information processing; (3) individual differences; (4) mental chronometry; (5) other components of the ERP than P300; and (6) methodologies and analytical techniques. GRA

N82-24828# Institute for Perception RVO-TNO, Soesterberg (Netherlands). Traffic Behavior Group.
A RATIONALE FOR THE DEVELOPMENT OF CUT-OFF SCORES
I. H. Veling Feb. 1981 19 p refs
(IZF-1981-3; TDCK-75517) Avail: NTIS HC A02/MF A01

How many response errors a subject is allowed before being defined as a nonmaster is considered. A model which defines the probability that masters and nonmasters respond correctly to an item, and that an individual is a master of that item, is presented. Cut-off scores must be greater than or equal to the test score of the X percent point of the binomial distribution with parameters M and m sub j (j = 1, 2,..., M), where X is a value close to zero, M is a set of bivalued items scored 1 whenever an item is answered correctly and j is an item. The model correctly determines the cut-off score in a traffic knowledge test. Author (ESA)

N82-24829# Institute for Perception RVO-TNO, Soesterberg (Netherlands). Experimental Psychology Group.
STRESS, INFORMATION PROCESSING AND DIVING
P. G. A. M. Jorna Apr. 1981 27 p refs
(Contract A79/KM/030)
(IZF-1981-4; TDCK-75518) Avail: NTIS HC A03/MF A01

The influence of experience on diver performance was investigated. Divers selected target letters from a series auditorily presented with 2 second intervals. Additional selective counting of these letters was required. Test dives were made at three periods in a training course, and performance was compared with an experienced group. Performance improves with training. Information selection is not influenced by experience, but the use of this information is less optimal for inexperienced divers. Physiological measures (heart rate, 0.10 Hz component, respiration) show a decreased response to the environment as training processes. Experienced divers show stable responses to being underwater. Author (ESA)

N82-24830# Institute for Perception RVO-TNO, Soesterberg (Netherlands). Experimental Psychology Group.
DISTRACTION IN VISUAL SEARCH
A. H. Wertheim Jun. 1981 17 p refs
(Contract A78/KL/081)
(IZF-1981-7; TDCK-75522) Avail: NTIS HC A02/MF A01

The search time lengthening effect of distractor stimuli in a visual search task, e.g., spotting ground targets from the air, was studied. Subjects sought target light spots on a screen with pseudorandomly distributed distractors. Six distracting stimuli within a field of 600 nontarget stimuli lengthen search time by 2.5 sec. When the number of distractor stimuli increases, this distraction effect changes into a search time shortening effect. Distraction is not related to the brightness or color qualities of nontarget stimuli. Distraction is affected by the foreground-background configuration of the visual field. This configuration depends on the expectancy of the observer with respect to the nature of the target. Author (ESA)

N82-24831# Institute for Perception RVO-TNO, Soesterberg (Netherlands). Vision Group.
RECOGNITION EXPERIMENTS WITH THERMAL IMAGES. PART 4: EFFECT OF SIGNAL TO NOISE RATIO
S. Mangouri and A. vanMeeteren Jun. 1981 14 p refs
(Contract A76/KL/080)
(IZF-1981-8; TDCK-75520) Avail: NTIS HC A02/MF A01

The effect of pictorial noise on the recognition of thermal images of military vehicles was studied. Thermographs were displayed indoors in a simulation, using a flying spot scanner with variable scan line density and variable amounts of noise added electronically in the scanning circuit. In each session, 69 pictures were presented in random order with the same scan line density and the same signal to noise ratio. Subjects were asked to identify the vehicles from 6 alternatives. Practically no effect is found for signal to noise ratios (per pixel, per 0.1 sec)

higher than 20, while there is only moderate decay when the ratio is reduced to 5. This decay is approximately the same over the investigated range of scan line densities. Author (ESA)

N82-24832# Institute for Perception RVO-TNO, Soesterberg (Netherlands). Experimental Psychology Group.
SEARCH TIMES IN TWO-DIMENSIONAL TABLES
W. A. Wagenaar and J. M. A. Fokkens Jul. 1981 8 p
(IZF-1981-10; TDCK-75524) Avail: NTIS HC A02/MF A01

The relation between search time in two-dimensional tables, e.g., timetables, and the number of rows/columns and alphabetical ordering was investigated. Subjects compared the table entry for a target with the digit typed beside the table. Results show that search time can be predicted from a weighted summation of the number of rows and columns. The weights are 230 msec for randomly ordered rows/columns, and 130 msec when rows or columns are alphabetized. Author (ESA)

N82-24258# Joint Publications Research Service, Arlington, Va.
PSYCHOLOGICAL ASPECTS OF AEROSPACE ORIENTATION
Avn G. Beregovoy *In its* USSR Rept.: Space, No. 15 (JPRS-80424) 29 Mar. 1982 p 45-49 Transl. into ENGLISH from Aviats. Kosmonavt. (USSR), no. 10, Oct. 1981 p 34-35 (For primary document see N82-24253 15-12)
Avail: NTIS HC A07/MF A01

54 MAN/SYSTEM TECHNOLOGY AND LIFE SUPPORT

Includes human engineering; biotechnology; and space suits and protective clothing.

N82-24833*# Purdue Univ., Lafayette, Ind. Dept. of Foods and Nutrition.
PLANT DIVERSITY TO SUPPORT HUMANS IN A CELSS GROUND BASED DEMONSTRATOR Final Report, 1 Jul. 1979 - 1 Oct. 1981
J. M. Howe and J. E. Hoff 1 Oct. 1981 49 p refs
(Grant NsG-2401)
(NASA-CR-168918; NAS 1.26:168918) Avail: NTIS HC A03/MF A01 CSCL 06K

A controlled ecological life support system (CELSS) for human habitation in preparation for future long duration space flights is considered. The success of such a system depends upon the feasibility of revitalization of food resources and the human nutritional needs which are to be met by these food resources. Edible higher plants are prime candidates for the photoautotrophic components of this system if nutritionally adequate diets can be derived from these plant sources to support humans. Human nutritional requirements information based on current knowledge are developed for inhabitants envisioned in the CELSS ground based demonstrator. Groups of plant products that can provide the nutrients are identified. T.M.

N82-24834*# Wisconsin Univ., Madison. Dept. of Horticulture.
CONTROLLED ECOLOGICAL LIFE SUPPORT SYSTEM: USE OF HIGHER PLANTS
T. W. Tibbits and D. K. Alford (Metropolitan State Coll.) May 1982 86 p refs Proc. of NASA Workshop held at Chicago, Nov. 1979 and at Moffett Field, Calif., Mar. 1980
(Grant NsG-2405)
(NASA-CP-2231; NAS 1.55:2231) Avail: NTIS HC A05/MF A01 CSCL 06K

Results of two workshops concerning the use of higher plants in Controlled Ecological Life Support Systems (CELSS) are summarized. Criteria for plant selection were identified from these categories: food production, nutrition, oxygen production and carbon dioxide utilization, water recycling, waste recycling, and other morphological and physiological considerations. Types of plant species suitable for use in CELSS, growing procedures, and research priorities were recommended. Also included are productivity values for selected plant species. Author

N82-24835*# Metrics, Inc., Atlanta, Ga.
CONTROLLED ECOLOGICAL LIFE SUPPORT SYSTEM: RESEARCH AND DEVELOPMENT GUIDELINES
Robert M. Mason, ed. and John L. Carden, ed. (Georgia Inst. of Technology) May 1982 99 p refs Proceedings of NASA Workshop held at Moffett Field, Calif., 9-12, 1979
(Grant NsG-2323)
(NASA-CP-2232; NAS 1.55:2323) Avail: NTIS HC A05/MF A01 CSCL 06K

Results of a workshop designed to provide a base for initiating a program of research and development of controlled ecological life support systems (CELSS) are summarized. Included are an evaluation of a ground based manned demonstration as a milestone in CELSS development, and a discussion of development requirements for a successful ground based CELSS demonstration. Research recommendations are presented concerning the following topics: nutrition and food processing, food production, waste processing, systems engineering and modelling, and ecology-systems safety. Author

N82-24836*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
CONTROLLED ECOLOGICAL LIFE SUPPORT SYSTEM - BIOLOGICAL PROBLEMS
Berrien Moore, III, ed. (New Hampshire Univ.) and R. D. MacElroy, ed. 1982 42 p refs
(NASA-CP-2233; A-8842; NAS 1.55:2233) Avail: NTIS HC A03/MF A01 CSCL 06K

The general processes and controls associated with two distinct experimental paradigms are examined. Specific areas for research related to biotic production (food production) and biotic decomposition (waste management) are explored. The workshop discussions were directed toward Elemental cycles and the biological factors that affect the transformations of nutrients into food, of food material into waste, and of waste into nutrients were discussed. To focus on biological issues, the discussion assumed that (1) food production would be by biological means (thus excluding chemical synthesis), (2) energy would not be a limiting factor, and (3) engineering capacity for composition and leak rate would be adequate. B.W.

N82-24837# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
PREDICTING PILOT OPINION RATINGS OF FLYING QUALITIES OF HIGHLY CONTROL AUGMENTED AIRCRAFT USING AN OPTIMAL PILOT MODEL M.S. Thesis
Randall M. Enright 8 Dec. 1981 172 p refs
(AD-A111136; AFIT/GAE/AA/80D-3) Avail: NTIS HC A08/MF A01 CSCL 05/8

A computer simulation was contructed using optimal control theory to model the human pilot. This optimal pilot model was used to evaluate highly control augmented aircraft and predict the human pilot opinion rating of its flying qualities. Eight aircraft/control system configurations were evaluated twice by the model using two different sets of initial conditions. The performance indices for each of the configurations were plotted and compared to a plot of the human pilot ratings of the same configurations. Variances were noted in the relative positioning of the performance ratings and the relative positioning of the pilot opinion ratings, and the mean difference in ratings between the performance index predictions and the pilot ratings varied with the initial conditions of the model (the initial conditions of the actual flight tests were unknown). The RMS error in the state response to system noise for each configuration was also plotted and compared to the pilot ratings. DOE

N82-24838# Institute for Perception RVO-TNO, Soesterberg (Netherlands).
DRIVING EXPERIENCE AND TASK DEMANDS IN SIMULATOR AND INSTRUMENTED CAR: A VALIDATION STUDY Progress Report
G. J. Blaauw 1980 33 p refs
(IZF-1980-9; TDCK-75108; PR-2) Avail: NTIS HC A03/MF A01

The absolute and relative validity of a fixed base vehicle simulator during straight road driving were evaluated in terms of system performance and driver behavior. Inexperienced and experienced drivers performed lateral and longitudinal vehicle

control in the simulator and in an instrumented car on the road. Each control was varied with a free and forced accuracy instruction resulting in four levels of task demand. Sequence effects between simulator and instrumented car, and training effects on each system, were studied. Overall results show a good absolute and relative validity for longitudinal vehicle control; lateral vehicle control shows good relative validity. Absolute validity is lacking in lateral control due to a worse perception of lateral translations (absence of kinesthetic feedback). Yaw rotations are perceived in the simulator quite well. The simulator discriminates between inexperienced and experienced drivers better than the instrumented car. Author (ESA)

55 PLANETARY BIOLOGY

Includes exobiology and extraterrestrial life.

No abstracts in this category.

59 MATHEMATICAL AND COMPUTER SCIENCES (GENERAL)

No abstracts in this category.

60 COMPUTER OPERATIONS AND HARDWARE

Includes computer graphics and data processing.

For components see *33 Electronics and Electrical Engineering*.

N82-24839* National Aeronautics and Space Administration. Hugh L. Dryden Flight Research Center, Edwards, Calif.
COMPUTER CIRCUIT CARD PULLER Patent
Ralph V. Sawyer and Bill Szuwalski, inventors (to NASA) Issued 29 Dec. 1981 5 p Filed 12 Mar. 1980 Supersedes N80-20589 (19 - 11, p 1424)
(NASA-Case-FRC-11042-1; US-Patent-4,307,510; US-Patent-Appl-SN-129778; US-Patent-Class-29-764; US-Patent-Class-29-267; US-Patent-Class-254-131) Avail: US Patent and Trademark Office CSCL 09B

The invention generally relates to hand tools, and more particularly to an improved device for facilitating removal of printed circuit cards from a card rack characterized by longitudinal side rails arranged in a mutually spaced parallelism and a plurality of printed circuit cards extended between the rails of the rack.
Official Gazette of the U.S. Patent and Trademark Office

N82-24840# Committee on Ways and Means (U. S. House).
AUTOMATED DATA PROCESSING SYSTEMS
Washington GPO 1981 77 p Hearing before the Subcomm. on Social Security and Subcomm. on Oversight of the Comm. on Ways and Means, 97th Congr., 1st Sess., 22 May 1981
(GPO-83-054) Avail: Subcommittee on Social Security

Critical problems facing the Social Security Administration in the management of its automated data processing system are identified. Software is old and virtually undocumented. Maintenance capacity for software is low. Because the software is old and is different languages, there is a serious problem in hiring and retaining programmers to work in a less than state of the art situation. The tape orientation of the system is labor intensive and causes serious security problems. The hardware is antiquated. Options designed to improve the system are discussed. R.J.F.

N82-24841# College de France, Paris. Lab. de Physique Corpusculaire.
MICROPROCESSORIZED MESSAGE MULTIPLEXER
S. Ejzman, L. Guglielmi, and J. J. Jseger Jul. 1980 20 p In FRENCH; ENGLISH summary
(LPC-80-26) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

The microprocessorized message multiplexer is an elementary development tool used to create and debug the software of a target microprocessor (User Module: UM). It connects together four devices; a terminal, a cassette recorder, the target microprocessor and a host computer where macro and editor for the M 6800 microprocessor are resident. DOE

N82-24842# Societe Nationale Industrielle Aerospatiale, Toulouse (France). Service Controle Automatique du Vol.
FLIGHT MANAGEMENT COMPUTER
J. Grossin 7 Jan. 1982 26 p In FRENCH Presented at Soc. des Electriciens et des Radioelectriciens (SEE), Nice, 26 Nov. 1981 Submitted for Publication
(SNIAS-821-111-110) Avail: NTIS HC A03/MF A01

Ways in which automatic flight control can reduce fuel consumption were investigated. Three domains were identified: (1) thrust optimization, (2) optimization of in-flight aerodynamic configuration, and (3) flight plan optimization. The use of flight management computers to achieve these goals is discussed and recently developed equipment is depicted. System design and functions are explained. The choice of performance optimization criteria (cost index) is considered. How a flight management computer deals with horizontal navigation is treated as an example. Author (ESA)

N82-24843# Institute for Perception RVO-TNO, Soesterberg (Netherlands). Human Engineering Group.
COMPUTER DISPLAY CONTROL DEVICES: A MODEL FOR PREDICTING PERFORMANCE WITH DIFFERENT DEVICES
D. Beevis Jan. 1981 24 p refs
(Contract A77/KM/132)
(IZF-1981-1; TDCK-75272) Avail: NTIS HC A02/MF A01

A model which predicts rapidity of target acquisition, using joysticks, roll balls and light pens is presented. The model is based on the application of Fitts' index of difficulty to the prediction of movement times for the hand and a cursor on the screen. Comparison with performance data shows that the model sets reliable lower limits for movement times. The model distinguishes naturalistic devices used by natural pointing movements from mechanistic ones where a cursor on a screen is controlled via a complex transfer function. If the devices are well designed, and the task is not overly simple, the movement times, or acquisition times, with a naturalistic device are less than with a mechanistic device. Author (ESA)

N82-24248# Centre National d'Etudes Spatiales, Toulouse (France).
ARCHITECTURE AND TESTS OF A COMPUTER SYSTEM FOR REAL TIME CONTROL [ARCHITECTURE ET TESTS D'UN SYSTEME INFORMATIQUE DE CONTROLE TEMPS REEL]
M. B. Despringre *In its* The Technol. of Spaceborne Sci. Expt. 1981 p 909-923 In FRENCH (For primary document see N82-24215 15-12)
Avail: NTIS HC A99/MF A01

N82-24250# Centre National d'Etudes Spatiales, Toulouse (France).
ARCHITECTURE OF A PREPROCESSING SYSTEM: ARCAD 3 [ARCHITECTURE D'UNE CHAINE DE PRETRAITEMENT: EXEMPLE ARCAD 3]
M. J. Dupic *In its* The Technol. of Spaceborne Sci. Expt. 1981 p 953-970 In FRENCH (For primary document see N82-24215 15-12)
Avail: NTIS HC A99/MF A01

N82-24252# Centre National d'Etudes Spatiales, Toulouse (France).
THE DATA PROCESSING CAPABILITIES OF THE TOULOUSE SPACE CENTER (CST) [LES MOYENS INFORMATIQUES DU CST]
A. Dargent *In its* The Technol. of Spaceborne Sci. Expt. 1981 p 983-1004 In FRENCH (For primary document see N82-24215 15-12)
Avail: NTIS HC A99/MF A01

N82-24382# Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany). Space Div.
MICROPROCESSOR SYSTEMS FOR SPACE APPLICATIONS IN A RADIATION ENVIRONMENT
A. G. Stanley and R. Rieger *In* ESA 2nd ESA Prod. Assurance Symp. Jan. 1982 p 147-157 refs (For primary document see N82-24362 15-31)
Avail: NTIS HC A11/MF A01; ESA, Paris FF 140 Member States, AU, CN and NO (+20% others)

61 COMPUTER PROGRAMMING AND SOFTWARE

Includes computer programs, routines, and algorithms.

N82-24844# Admiralty Marine Technology Establishment, Teddington (England).
FOUNDATIONS FOR THE DEVELOPMENT OF A SIMPLE NATURAL LANGUAGE INTERFACE FOR TASK KNOWLEDGE ELICITATION AND REPRESENTATION
M. B. Browley Jan. 1982 53 p refs
(AMTE(E)-TM-81102; BR82261) Copyright. Avail: Issuing Activity

The state of the art in natural language understanding is reviewed. The relative importance of 'meaning', 'syntax' and 'semantics' is discussed and parsers are surveyed. Parsers assign a structure to an input and recognize the input as belonging to the language described by the grammar, either by beginning with a start symbol (S) and working down until a terminal symbol (an individual word) is encountered, or by starting with the sentence and trying to reduce it to S. Semantic parsing includes semantic primitives, semantic networks, slot grammars and procedural semantics. Slot grammar parsing was chosen for the natural language interface with a naval command and control intelligent support system, since it is a language understanding system equivalent of frame methodology. Also, it focuses on the verb, an important factor in an action oriented system.
Author (ESA)

N82-24845*# Research Triangle Inst., Research Triangle Park, N. C. Systems and Measurements Div.
PRODUCTION OF RELIABLE FLIGHT CRUCIAL SOFTWARE: VALIDATION METHODS RESEARCH FOR FAULT TOLERANT AVIONICS AND CONTROL SYSTEMS SUB-WORKING GROUP MEETING
J. R. Dunham, ed. and J. C. Knight, ed. (Virginia Univ.) May 1982 27 p refs Meeting held at Research Triangle Park, N.C., 2-4 Nov. 1981
(NASA-CP-2222; L-15291; NAS 1.55:2222) Avail: NTIS HC A03/MF A01 CSCL 09B

The state of the art in the production of crucial software for flight control applications was addressed. The association between reliability metrics and software is considered. Thirteen software development projects are discussed. A short term need for research in the areas of tool development and software fault tolerance was indicated. For the long term, research in format verification or proof methods was recommended. Formal specification and software reliability modeling, were recommended as topics for both short and long term research. N.W.

N82-24846*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.
COMBINING ANALYSIS WITH OPTIMIZATION AT LANGLEY RESEARCH CENTER. AN EVOLUTIONARY PROCESS
James L. Rogers, Jr. Apr. 1982 11 p refs Proposed for presentation at the 2nd Intern. Computer Eng. Conf. and Show, San Diego, Calif., 15-19 Aug. 1982
(NASA-TM-84472; NAS 1.15:84472) Avail: NTIS HC A02/MF A01 CSCL 09B

The evolutionary process of combining analysis and optimization codes was traced with a view toward providing insight into the long term goal of developing the methodology for an integrated, multidisciplinary software system for the concurrent analysis and optimization of aerospace structures. It was traced along the lines of strength sizing, concurrent strength and flutter sizing, and general optimization to define a near-term goal for combining analysis and optimization codes. Development of a modular software system combining general-purpose, state-of-the-art, production-level analysis computer programs for structures, aerodynamics, and aeroelasticity with a state-of-the-art optimization program is required. Incorporation of a modular and flexible structural optimization software system into a state-of-the-art finite element analysis computer program will facilitate this effort. This effort results in the software system used that is controlled with a special-purpose language, communicates with a data management system, and is easily modified for adding new programs and capabilities. A 337 degree-of-freedom finite element model is used in verifying the accuracy of this system. M.D.K.

N82-24847# State Univ. of New York at Buffalo. Group for Computer Studies of Strategies.
THE ADVICE-TAKER/INQUIRER
George L. Sicherman Dec. 1981 26 p refs
(Grant AF-AFOSR-0220-81)
(AD-A111926; TR-193; GCSS-TR-5; AFOSR-82-0094TR) Avail: NTIS HC A03/MF A01 CSCL 09/2

This report describes an intelligent system, the Advice-Taker/Inquirer. Its principal capabilities are: (1) accept expert advice in the form of principles; (2) accept expert advice in the form of examples; (3) make inquiries to the advisor when the advice is vague, incomplete, or contradictory; (4) apply the advice in the field; and (5) evaluate and adapt its advice on the basis of experience. The motivation for such a system is obvious. Many task environments are so complex that it is impossible or impractical to specify an effective algorithmic strategy for them. In such environments the best way to specify a strategy usually is in terms of principles. The value of being able to use examples is that a single example may be more instructive than a large number of principles. The system makes inquiries when it detects logical problems with the advice, in order that it may not blindly follow an illogical strategy. Finally, the system applies and evaluates the advice in order to detect practical problems with the advice. If the system has access to a system that simulates the problems domain, it can detect practical problems before applying the strategy in the real world. GRA

N82-24848# Stanford Univ., Calif. Computer Systems Lab.
DIRECTLY EXECUTED LANGUAGES Final Report, 25 Sep. 1978 - 24 Sep. 1981
Michael J. Flynn Jan. 1982 16 p refs
(Grant DAAG29-78-G-0205)
(AD-A110861; ARO-15877.2-EL) Avail: NTIS HC A02/MF A01 CSCL 09/2

The research reviewed in this study specifically covered 3 issues: (1) the design of 'ideal execution architectures' suitable for a range of source languages and host machine environments; (2) analysis of the relation between source language program constructs and execution architectures; and (3) methods of implementing these 'ideal' instruction sets. GRA

N82-24849# Oak Ridge National Lab., Tenn.
QUEST: A STANDARD OPERATOR INTERACTION SUBROUTINE
D. E. Greenwood Nov. 1981 37 p refs
(Contract W-7405-eng-26)
(DE82-003519; ORNL/CSD/TM-132) Avail: NTIS HC A03/MF A01

Software which makes easy interaction possible between computer programs and users in a friendly, sophisticated manner is described. Two routines work together to provide such features as short and long prompting formats, multiple levels of help text, null response recognition, default answers, and response verification. Simple run time commands permit users to adjust

the amount of interactive information displayed to suit their knowledge of the program. Experienced users may even bypass a known sequence of questions by entering several answers at one time. As a result, users should make fewer data entry mistakes caused by boredom, impatience, or simple ignorance. The routines are written in FORTRAN IV for use on PDP-11 computers running under RSX-11M. Examples in the report show question definition, calling sequences and operator interaction. DOE

N82-24850# National Bureau of Standards, Washington, D.C.
TEST PROBLEMS AND RESULTS FOR OMNITAB 80 Final Report
Sally T. Peavy and Shirley G. Bremer Nov. 1981 320 p refs (PB82-136474; NBS-TN-1147) Avail: NTIS HC A14/MF A01 CSCL 09B

A set of 69 test problems and results for the OMNITAB 80 system is provided to assist individuals in checking the installation of the OMNITAB 80 system on their particular computer. These descriptive examples are also instructive in the use of the OMNITAB 80 system. GRA

N82-24851# Maryland Univ., College Park. Dept. of Computer Science.
EXPRESSING THE FORMAL SEMANTIES OF CSP AND CP OR ADA TASKING WITH THE TEMPORAL LOGIC LANGUAGE XYZ/E
Chih-sung Tang Nov. 1981 24 p refs
(Contract F49620-80-C-0001; AF Proj. 2304)
(AD-A111504; AFOSR-82-0076TR) Avail: NTIS HC A02/MF A01 CSCL 09/2

A temporal logic language XYZ/E is introduced. It is a temporal logic system as well as a programming language. it has two forms: the internal form is in lower level, but there are several abbreviation rules which can transform a program in internal form into a higher level external form and vice versa.
Author (GRA)

N82-24852# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
DESCRIPTION OF A PROGRAM FOR KALMAN FILTERING AND RAUCH SMOOTHING TECHNIQUES, APPLICABLE TO NONLINEAR SYSTEMS WITH CONTINUOUS EVOLUTION AND DISCRETE OBSERVATION MODELS
Claude Aumasson and Therese Cotillon 1981 71 p refs In FRENCH; ENGLISH summary Report will also be announced as translation (ESA-TT-766)
(ONERA-NT-1981-5; ISSN-0078-3781; ESA-TT-766) Avail: NTIS HC A04/MF A01

The theory of Kalman filtering and Rauch smoothing when applied to dynamic systems is presented. System evolution is governed by a nonlinear, continuous, differential equation and its observation by a nonlinear discrete time equation. Relatively unknown aspects of the smoothing technique are emphasized. The organization of FIKALM and LIRAUC, subroutines that permit estimation of state and parameters for dynamic systems of this form, is described. Tasks to be performed by the program user, relative to the specific physical problem treated, are outlined in order that evolution and observation equations can be fully specified. This computational method is illustrated by an example of aircraft longitudinal attitude and trajectory estimation from radar observations. Author (ESA)

N82-24853# Federal Compiler Testing Center, Falls Church, Va. Office of Software Development.
HARRIS CORPORATION, HARRIS 1600-02 MODEL 2, HARRIS INTERACTIVE COBOL, VERSION 107.1 (VALIDATION)
21 Aug. 1981 57 p Sponsored by General Services Administration
(PB82-134412; FCTC-81-104) Avail: NTIS HC A04/MF A01 CSCL 09B

A consolidated summary of the results obtained from the validation of the subject compiler against the 1974 COBOL standard is given. The compiler was validated at the low intermediate level. Discrepancies are listed by level/module within X3 .23-1974, a section relating the categories of discrepancies to each of the Federal levels of the language, and detailed listing of discrepancies together with the tests which were failed is given. GRA

N82-24230# Centre National d'Etudes Spatiales, Toulouse (France).
SPACEBORNE COMPUTER PROGRAMS [LE LOGICIEL EMBARQUE]
J. Abadie *In its* The Technol. of Spaceborne Sci. Expt. 1981 p 461-481 refs In FRENCH (For primary document see N82-24215 15-12)
Avail: NTIS HC A99/MF A01

N82-24249# Centre National d'Etudes Spatiales, Toulouse (France).
WORKING UP A PREPROCESSING SYSTEM [REALISATION D'UNE CHAINE DE PRETRAITEMENT]
Denis Monchy *In its* The Technol. of Spaceborne Sci. Expt. 1981 p 925-951 refs In FRENCH (For primary document see N82-24215 15-12)
Avail: NTIS HC A99/MF A01

N82-24251# Observatoire de Meudon (France).
VALIDATION AND APPLICATION OF PREPROCESSING [VALIDATION ET MISE EN EXPLOITATION DU PRETRAITEMENT]
S. Hoang *In its* The Technol. of Spaceborne Sci. Expt. 1981 p 971-982 In FRENCH (For primary document see N82-24215 15-12)
Avail: NTIS HC A99/MF A01

N82-24384# National Centre of Systems Reliability, Warrington (England).
SOFTWARE RELIABILITY
B. K. Daniels *In* ESA 2nd ESA Prod. Assurance Symp. Jan. 1982 p 167-183 refs (For primary document see N82-24362 15-31)
Avail: NTIS HC A11/MF A01; ESA, Paris FF 140 Member States, AU, CN and NO (+20% others)

N82-24386# TRW, Inc., Redondo Beach, Calif. Space and Technology Group.
SOFTWARE PRODUCT ASSURANCE: LEARNING LESSONS FROM HARDWARE
Eugene Sloane and Joseph Wrobleski *In* ESA 2nd ESA Prod. Assurance Symp. Jan. 1982 p 191-200 refs (For primary document see N82-24362 15-31)
Avail: NTIS HC A11/MF A01; ESA, Paris FF 140 Member States, AU, CN and NO (+20% others)

N82-25103*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
AN AUTOMATED FORTRAN DOCUMENTER
T. Erickson *In its* The Telecommun. and Data Acquisition Rept. 15 Apr. 1982 p 78-85 (For primary document see N82-25092 15-99)
Avail: NTIS HC A09/MF A01 CSCL 09B

62 COMPUTER SYSTEMS

Includes computer networks.

N82-24854# Comptroller General of the United States, Washington, D.C.
MOST FEDERAL AGENCIES HAVE DONE LITTLE PLANNING FOR ADP DISASTERS Report to the Congress
18 Dec. 1980 28 p
(AFMD-81-16) Avail: NTIS HC A02/MF A01

Vulnerability of Federal ADP systems to disasters such as floods, fires, earthquakes, or terrorist attacks is addressed. A lack of understanding in the Federal government of the importance of ADP backup planning was found. Of 55 activities reviewed, none was considered adequate. Risk analysis and ADP backup planning are considered. Five ADP backup recommendations are included: (1) increased management involvement, (2) periodic testing of plans, (3) evaluation of plans and review of tests and

test results, (4) development of standards, and (5) policy cautioning against modifying operating system software. N.W.

63 CYBERNETICS

Includes feedback and control theory.

For related information see also *54 Man/System Technology and Life Support.*

N82-24855# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.

OPTIMAL CONTROL USING FREQUENCY WEIGHTED COST FUNCTIONALS M.S. Thesis

D. V. Palmer Dec. 1981 95 p refs

(AD-A111129; AFIT/GAE/AA/81D-22) Avail: NTIS HC A05/MF A01 CSCL 14/1

A simple lightly damped second-order system is augmented with an optimal controller using linear quadratic regulator theory. However, instead of using conventional optimal control design methods, the controller is designed with frequency weighted cost functionals. This report investigates the effect of frequency shaping on the frequency and time response characteristics of the closed-loop system. The effects of frequency shaping on the state and control penalty matrices are analyzed separately. Each test case yields improved damping ratios compared with the baseline open-loop system. Each system, including the baseline model, has a high frequency asymptote slope of -40 dB/decade. There is very little difference in the high-frequency response characteristics of the frequency shaped augmented systems and the open-loop system. The most important result is that the low frequency magnitude response can be reduced by using frequency shapings. This is particularly useful in attenuating low frequency system modes as well as low frequency noise.

Author (GRA)

N82-24856# Oxford Univ. (England). Dept. of Engineering Sciences.

SELF-TUNING P.I. CONTROL: SOME EXPERIMENTS

P. J. Gawthrop (Sussex Univ., England) 1981 30 p Sponsored by UK SRC

(OUEL-1385/81) Avail: NTIS HC A03/MF A01

Experiments, involving a water tank with pneumatic level sensor and diaphragm valve (without positioning) interfaced via transducers to a zero to 10 V voltage signal and 4 to 70 mA current signal, respectively, are described. A record of an adaptive PI controller, operating on a well-defined process, was obtained which .s suitable for comparison with other control methods. All experimental data are presented. The details of a PI version of the hybrid self-timing controlled are summarized. A standard set of initial conditions applicable to such an approximately first-order process was tested. Results show that this tank water level system is an example of a process that is not difficult to control with a well-tuned PI control; best results are achieved using a carefully tuned pneumatic PI regulator. Such a process is typical of those to which a 'down market' self-tuner can be applied. Author (ESA)

N82-24857# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).

SYNTHESIS OF NON-INTERACTING CONTROLS FOR LINEAR AND NONLINEAR SYSTEMS

Omer Mercier 1981 44 p refs In FRENCH; ENGLISH summary Report will also be announced as translation (ESA-TT-760)

(ONERA-NT-1981-6; ISSN-0078-3781) Avail: NTIS HC A03/MF A01

All known practical methods to synthesize decoupled, or noninteracting controls for a wide variety of linear and nonlinear dynamic systems are summarized. Using these controls, individual system outputs are independently controlled. In addition, the poles of the closed-loop controlled system may be in general arbitrarily assigned to satisfy regulation quality criteria. For each class of systems under consideration and for each control type, numerical examples are given to illustrate the methods and to facilitate understanding of theoretical developments. In the particular case of nonlinear systems, the theory is illustrated by an application to the attitude control of an aerospace vehicle with complex and large amplitude commanded slewing motions. Robustness properties of this control law are especially studied. In its application to linear systems, decoupling control theory is competitive with equally attractive methods; in the case of nonlinear systems, no other method is known to synthesize an explicit closed-loop control law which, beyond decoupling, ensures a stable behavior for the controlled system. Author (ESA)

64 NUMERICAL ANALYSIS

Includes iteration, difference equations, and numerical approximation.

N82-24858*# National Aeronautics and Space Administration. Langley Research Center, Hampton, Va.

RECENT DEVELOPMENTS IN TRANSONIC EULER FLOW OVER A CIRCULAR CYLINDER

Manuel D. Salas Apr. 1982 15 p refs

(NASA-TM-83282; NAS 1.15:83282) Avail: NTIS HC A02/MF A01 CSCL 20D

Numerical solutions to the Euler equations for transonic flow over a circular cylinder indicate that the inviscid flow separates ahead of the rear stagnation point. This phenomenon and various solutions related to this subject are discussed. Author

N82-24859*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

RELAXATION SOLUTION OF THE FULL EULER EQUATIONS

Gary M. Johnson 1982 9 p refs Presented at the 8th Intern. Conf. on Numerical Methods in Fluid Dyn., Aachen, West Germany, 28 Jun. - 2 Jul. 1982; sponsored by Deutsche Forschungsgemeinschaft, Dornier G.m.b.H., Messerschmitt-Boelkow-Blohm G.m.b.H., ONR and ERO

(NASA-TM-82889; E-1265; NAS 1.15:82889) Avail: NTIS HC A02/MF A01 CSCL 12A

A numerical procedure for the relaxation solution of the full steady Euler equations is described. By embedding the Euler system in a second order surrogate system, central differencing may be used in subsonic regions while retaining matrix forms well suited to iterative solution procedures and convergence acceleration techniques. Hence, this method allows the development of stable, fully conservative differencing schemes for the solution of quite general inviscid flow problems. Results are presented for both subcritical and shocked supercritical internal flows. Comparisons are made with a standard time dependent solution algorithm. Author

N82-24860# State Univ. of New York at Buffalo. Dept. of Computer Science.

AN ALGEBRAIC STRUCTURE THEORY OF RULE SETS. 1: A FORMALIZATION OF BOTH PRODUCTION SYSTEMS AND DECISION TABLES

Shinji Moriya Dec. 1981 44 p refs Sponsored in part by Niwa-kinen-kai, Tokyo

(Grant AF-AFOSR-0220-81; AF Proj. 2304)

(AD-A111243; AFOSR-82-0055TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

In this paper by a rule we shall mean the form if...then... . A rule set is a collection of rules. We have been using those rules in production systems and decision tables. This paper formalizes both production systems and decision tables as rule sets based on free Boolean algebra and constructs an algebraic structure theory of rule sets. In the formalization we show that we can deal with production systems and decision tables in much the same way, and we define the two-level hierarchical structure (e.g., the free Boolean rule sets and their interpretations) of abstract rule sets (knowledge bases). After formally defining the logical rule system, which is a theoretical model of conventional production systems and decision tables, this paper identifies the concepts of independence and exclusiveness between rules of the system, and derives several fundamental properties between rules and between actions. The theory described in this paper may be useful as a basis for describing, interpreting, analyzing, and synthesizing rule sets (production systems and decision tables) in both the theoretical and practical aspects. Author (GRA)

N82-24861# Washington Univ., St. Louis, Mo. Dept. of Systems Science and Mathematics.
THE CONSTRAINT METHOD FOR SOLID FINITE ELEMENTS Final Scientific Report, 1 Oct. 1976 - 30 Sep. 1981
I. Norman Katz Oct. 1981 10 p refs
(Grant AF-AFOSR-3122-77; AF Proj. 2304)
(AD-A111895; AFOSR-82-0088TR) Avail: NTIS HC A02/MF A01 CSCL 09/2

The p-version of the finite element method is a new approach to finite element analysis which has been demonstrated to lead to significant computational savings, often by orders of magnitude (this approach was formerly called the constraint method; the new term p-version is more descriptive). Conventional approaches (called the h-version) generally employ low order polynomials as basis functions. Accuracy is achieved by suitably refining the approximating mesh. The p-version uses polynomials of arbitrary order p > or = 2 for problems in plane elasticity where C0 continuity is required and polynomials or order p > or = 5 for problems in plate bending where c1 continuity is required. GRA

N82-24862# Stanford Univ., Calif. Inst. for Mathematical Studies in the Social Sciences.
INFINITE EXCESSIVE AND INVARIANT MEASURES
Michael I. Taksar May 1981 35 p refs
(Contract N00014-79-C-0685)
(AD-A111667; TR-334) Avail: NTIS HC A03/MF A01 CSCL 12/1

In the paper (Enhancing of Semigroups) the following problem was considered. Given a contraction semigroup T sub t on a Borel space D and an excessive measure nu, when is it possible to find another contraction semigroup approximately T sub t 1 such that approximately T sub t 1 > or = T sub t and nu is invariant with respect to approximately T sub t 1. The most restrictive condition under which this problem was solved is the finiteness of the excessive measure nu. This condition excludes such an interesting case as the semigroup T sub t generated by the transition function of Wiener's process and the Lebesgue measure nu. In the present paper we extend the results to all quasi-finite null-excessive measures nu. GRA

N82-24863# Stanford Univ., Calif. Inst. for Mathematical Studies in the Social Sciences.
CONDITIONS FOR TRANSITIVITY OF MAJORITY RULE WITH ALGORITHMIC INTERPRETATIONS
Herve J. P. Raynaud Aug. 1981 20 p refs
(Contract N00014-79-C-0683)
(AD-A111673; SU-TR-347) Avail: NTIS HC A02/MF A01 CSCL 12/1

Using particular cases of the condition Ref (nu,i,j) (in Koelher 1978), one can derive nine conditions for transitivity of the method of majority decision which all possess a generating algorithm with possible sociological or economical interpretations. Some celebrated conditions appear to be particular cases of this structure. Some other, 'new conditions,' at least new under their algorithmic form, suggest explanation for some efficient committee votings. Author (GRA)

N82-24864# Wayne State Univ., Detroit, Mich.
COMPUTATIONAL SOLUTION OF RANDOM INTEGRAL EQUATIONS Final Report, 10 Jun. 1977 - 31 Aug. 1981
A. T. Bharucha-Reid 21 Dec. 1981 6 p refs
(Grant DAAG29-77-C-0164)
(AD-A111609; ARO-15016.9-M; FR-1) Avail: NTIS HC A02/MF A01 CSCL 12/1

This research project was concerned with the initial stages of the systematic development of approximate methods (analytical and computational) for the solution of random integral equations. Author (GRA)

N82-24865# Stanford Univ., Calif. Dept. of Computer Science.
NUMERICAL METHODS BASED ON ADDITIVE SPLITTINGS FOR HYPERBOLIC PARTIAL DIFFERENTIAL EQUATIONS
Randall J. LeVeque and Joseph Olinger Oct. 1981 30 p refs Sponsored in part by Hertz Foundation
(Contract N00014-75-C-1132; Grant NSF MCS-77-02082; NR Proj. 044-492)
(AD-A110530; SU-STAN-NA-81-16) Avail: NTIS HC A03/MF A01 CSCL 12/1

We derive and analyze several methods for systems of hyperbolic equations with wide ranges of signal speeds. These techniques are also useful for problems whose coefficients have large mean values about which they oscillate with small amplitude. Our methods are based on additive splittings of the operators into components that can be approximated independently on the different time scales, some of which are sometimes treated exactly. The efficiency of the splitting methods is seen to depend on the error incurred in splitting the exact solution operator. This is analyzed and a technique is discussed for reducing this error through a simple change of variables. A procedure for generating the appropriate boundary data for the intermediate solutions is also presented. Author (GRA)

N82-24866# Texas Technological Univ., Lubbock. Dept. of Mathematics.
APPLICATIONS OF INVARIANT IMBEDDING Final Scientific Report, 1 Jul. 1980 - 30 Jun. 1981
Paul Nelson Dec. 1981 21 p refs
(Contract AF-AFOSR-80-0235; AF Proj. 2304)
(AD-A110543; AFOSR-82-0028TR) Avail: NTIS HC A02/MF A01 CSCL 12/1

Invariant imbedding is a method for the computational solution of two-point boundary-value problems. One common source of such problems is in the application of the method of lines, or an expansion procedure, to a system of partial differential equations. Such partial differential equations might describe, for example, the dynamic mechanics of structures such as an aircraft fuselage or a missile silo. The research conducted under this grant has been directed toward two objectives. The first objective was to improve the effectiveness and efficiency of invariant imbedding by providing means for automatically controlling the associated computational effort. The second objective was to extend the range of applicability of invariant imbedding to include singular two-point boundary-value problems. Such singular problems arise, for example, by applying the method of lines to partial differential equations in spherical or cylindrical coordinate systems. In regard to the first of these objectives, a number of different methods, which are generically termed 'relative-error monitors', have been developed and are in the process of being subjected to computational experimentation. As regards the second objective, it has been shown how to apply the method of invariant imbedding to 'homogeneous' linear two-point boundary-value problems. The further extension to inhomogeneous problems is presently being pursued. Author (GRA)

N82-24867# Yale Univ., New Haven, Conn. Systems and Information Sciences.
STABILIZABILITY OF SECOND ORDER BILINEAR SYSTEMS
Daniel E. Koditschek and Kumpati S. Narendra Nov. 1981 14 p refs Sponsored in part by NSF
(Contract N00014-76-C-0017)
(AD-A111073; S/I-8109) Avail: NTIS HC A02/MF A01 CSCL 12/1

This report concerns the stabilizability of second order bilinear systems. While a large literature devoted to the structural properties of such systems has developed over the past decade, it is fair to say that little is understood regarding the qualitative behavior of trajectories. Recently, several authors have investigated the stabilizability of systems. These papers derive sufficient conditions and construct controllers to stabilize systems which meet specific and quite restrictive requirements. A constant pure quadratic feedback law is shown to stabilize. It is demonstrated that a constant linear and quadratic feedback law forces trajectories into an arbitrarily small bounded neighborhood of the origin. It is our opinion that a significant understanding of bilinear systems will not be possible until more systematic analysis has been accomplished. Accordingly, in this report we concentrate on a simple problem in some detail. Specifically, we give necessary and sufficient conditions for the existence of a constant linear feedback controller to stabilize. Even given the limited scope of this problem, it is safe to say that the statement of necessary and sufficient conditions is possible only because of recent results in the stability of quadratic systems developed by the authors. GRA

N82-24868# Naval Postgraduate School, Monterey, Calif.
STATIONARY DISCRETE AUTOREGRESSIVE-MOVING AVERAGE TIME SERIES GENERATED BY MIXTURES
P. A. Jacobs and P. A. W. Lewis Jan. 1982 39 p refs
(Grants NSF ENG-79-01438; NSF ENG-79-10825; NR Proj. 042-284; NR Proj. 042-469)
(AD-A111459; NPS55-82-003) Avail: NTIS HC A03/MF A01 CSCL 12/1

Two simple stationary processes of discrete random variables with arbitrarily chosen first-order marginal distributions, DARMA(p,N+1) and NDARMA(p,N), are given. The correlation structure of these processes mimics that of the usual linear ARMA(p,q) processes. The relationship of these processes to mover-stayer models, and to models for discrete time series given separately by Lindqvist and Pegram is discussed. Ad-hoc nonparametric estimators for the parameters in the DARMA(p,N+1) and NDARMA(p,N) are given. A simulation study shows them to be as good as maximum likelihood estimators for the first-order autoregressive case, and to be much simpler to compute than the maximum likelihood estimators. Author (GRA)

N82-24869# Delaware Univ., Newark. Applied Mathematics Inst.
ON MODIFIED GREEN'S FUNCTIONS IN EXTERIOR PROBLEMS FOR THE HELMHOLTZ EQUATION
R. E. Kleinman and G. F. Roach (Strathclyde Univ.) Dec. 1981 46 p refs
(Grant AF-AFOSR-0156-81; AF Proj. 2304)
(AD-A111089; TR-116A; AFOSR-82-0034TR) Avail: NTIS HC A03/MF A01 CSCL 12/1

Recently, Jones has presented a method for overcoming the non uniqueness problem arising in boundary integral equation formulation of the Dirichlet and Neumann problems for the Helmholtz equation. The major portion of Jones' analysis concerned the exterior Neumann problem in two dimensions although he indicated how the results generalized to three dimensions and suggested that the exterior Dirichlet problem could be similarly treated. Ursell simplified the proof of a key theorem, but confined his remarks to the exterior Neumann problem in two dimensions. The authors presented a systematic exposition of boundary integral equation formulations of both Dirichlet and Neumann problems and presented a number of useful properties of the boundary integral operators arising in both layer theoretic and Green's function approaches. In particular, it was shown that uniqueness of the boundary integral equation formulations of exterior problems could be retained even at eigenvalues of the corresponding adjoint interior problems by treating a pair of coupled equations. That treatment dealt with three dimensional problems although the results remain intact when the fundamental solution of the Helmhotz equation in n dimensions is used. GRA

N82-24870# Oak Ridge National Lab., Tenn.
STEEPEST DESCENT FOR SYSTEMS OF NONLINEAR PARTIAL DIFFERENTIAL EQUATIONS
J. W. Neuberger Oct. 1981 29 p refs
(Contract W-7405-eng-26)
(DE82-001950; ORNL/CSD/TM-161) Avail: NTIS HC A03/MF A01

A steepest descent method for numerical solution of nonlinear partial differential equations is described. The method is independent of type and is applicable to a wide variety of flow problems. DOE

N82-24871# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
ON THE COMPUTATION OF WEAK SOLUTIONS OF HYPERBOLIC SYSTEMS OF CONSERVATION LAWS BY DIFFERENCE SCHEMES Ph.D. Thesis - Paris Univ. 6
A. Lerat (Ecole Nationale Superieure d'Arts et Metiers, Paris) 1981 218 p refs In FRENCH; ENGLISH summary Report will also be announced as translation (ESA-TT-762)
(ONERA-P-1981-1; ISSN-0078-379X) Avail: NTIS HC A10/MF A01

Numerical methods of compressible fluid dynamics which deal with the approximation of weak solutions of hyperbolic systems of conservation laws by finite difference schemes in conservation form are considered. These schemes allow the computation of discontinuity waves with no need of a special treatment, but they involve some shortcomings, such as the appearance of spurious oscillations in the vicinity of shocks and contact discontinuities. These shortcomings, in which nonlinearities play a prominent part, are analyzed by the equivalent system approach which reduces the study of numerical schemes to one of partial differential equations, including the terms of the exact system and additional terms standing for the approximation error. General properties of numerical schemes for hyperbolic systems are presented. A class explicit scheme of second order accuracy is constructed and the choice of an optimal scheme with regard to spurious oscillations, in the case of one space variable, is treated. Author (ESA)

N82-24872# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
EXPLICIT SECOND ORDER SPLITTING SCHEMES FOR SOLVING HYPERBOLIC NONLINEAR PROBLEMS: THEORY AND APPLICATIONS TO TRANSONIC FLOWS Ph.D. Thesis - Paris Univ. 6
Pierre Laval 1981 239 p refs In FRENCH; ENGLISH summary Report will also be announced as translation (ESA-TT-768)
(ONERA-NT-1981-10; ISSN-0078-3781) Avail: NTIS HC A11/MF A01

A general class of explicit second-order splitting schemes is introduced and studied for solving hyperbolic nonlinear unsteady two and three-dimensional systems. Standard one-dimensional second order schemes, by Lerat-Peyret, are used at fractional steps. The derived disintegration schemes, with four, six or eight parameters for two-dimensional and six, ten or twelve parameters for three-dimensional problems, are shown to be of second order. Applying those schemes, third-order approximation systems (or equivalent systems) are obtained. Analyzing equivalent systems, a subclass of schemes, which are dissipative with minimal dissipation in each direction, is derived. The general class is applied to a two-dimensional scalar equation; in this case schemes of the subclass are optimal (defined as dissipative with minimal dissipation). The results obtained confirm the significant improvements that can be expected from these optimal schemes which yield, for instance, a numerically stable solution for the shock problem without any artificial viscosity. Author (ESA)

N82-24873# Cambridge Univ. (England). Dept. of Engineering.
OPTIMIZATION OF STOCHASTIC RELAY CONTROL SYSTEMS BY MEANS OF DIMENSIONAL ANALYSIS
A. T. Fuller 1981 73 p refs
(PB82-134610; CUED/F-CAMS/TR-216-1981) Avail: NTIS HC A04/MF A01 CSCL 12A

Optimal feedback control is investigated for a second order plant with white noise disturbances and with bounded control. The white noises are state dependent and the system is such that dimensional analysis can be applied with advantage. The optimal controller is found to be represented by a switching curve which is determined analytically to within a single parameter. To find the value of this parameter, the Belman-Forentin partial differential equation of optimal stochastic control is converted to an ordinary differential equation by means of dimensional analysis, and a resulting two point boundary value problem is solved numerically. GRA

N82-24874# Purdue Univ., Lafayette, Ind. School of Civil Engineering.
INFERENCE PROCEDURE WITH UNCERTAINTY FOR PROBLEM REDUCTION METHOD
M. Ishizuka, K. S. Fu, and J. T. P. Yao Aug. 1981 43 p refs
(Grant NSF PFR-79-06296)
(PB82-131772; CE-STR-81-24; NSF/CEE-81039) Avail: NTIS HC A03/MF A01 CSCL 12A

In the application of artificial intelligence to complex decisionmaking problems, a decisionmaking tree is employed. Rational inference procedures for problem reduction are described which are based on either Bayes' theory or Dempster and Shafer's theory. At each branch of the decision tree, a probability is assigned to the evidence at that branch. In the Bayesian system, if there is a 75 percent probability that the evidence is true, for example, then there must be a 25 percent probability that the evidence is false. The Dempster and Shafer system allows for

ignorance of evidence. A modification of the Bayesian, and Dempster and Shafer systems is presented which includes fussy reasoning, an approximate reasoning process which is compatible with human intuitions, and can yield a plausible answer even for problems in which all conditions for mathematical approaches are not satisfied. Fuzzy reasoning is presented as an alternative to statistical approaches in problem reduction. GRA

65 STATISTICS AND PROBABILITY

Includes data sampling and smoothing; Monte Carlo method; and stochastic processes.

N82-24875# Georgia Inst. of Tech., Atlanta. Production annd Distribution Research Center.
ON THE COMPUTATIONAL COMPLEXITY OF STOCHASTIC SCHEDULING PROBLEMS
Michael Pinedo Sep. 1981 13 p refs
(Contract N00014880-K-0709; NR Proj. 047-221)
(AD-A108089; PDRC-81-11) Avail: NTIS HC A02/MF A01 CSCL 12/1

In this paper we consider stochastic scheduling models where all relevant data (like processing times, release dates, due dates, etc.) are independent random variables, exponentially distributed. We are interested in the computational complexity of determining optimal policies for these stochastic scheduling models. We give a number of examples of models in which the optimal policies can be determined by polynomial time algorithms while the deterministic counterparts of these models are NP-complete. We also give some examples of stochastic scheduling models for which there exists no polynomial time algorithm if P is not equal NP. Author (GRA)

N82-24876# Stanford Univ., Calif. Systems Optimization Lab.
AN ADAPTIVE IMPORTANCE SAMPLING PROCEDURE
Jerome H. Friedman and Margaret H. Wright Nov. 1981 13 p refs
(Contracts N00014-75-C-0267; DAAG29-79-C-0110; DE-AC03-76SF-00515; DE-AC03-76SF-00326; DE-AT03-76ER-72018; Grants NSF MCS-79-26009; NSF ECS-80-12974; NR Proj. 047-143)
(AD-A110840; SU-SOL-81-23) Avail: NTIS HC A02/MF A01 CSCL 12/1

Monte Carlo calculations often require generation of a random sample of n-dimensional points drawn from a specified multivariate probability distribution. We present an importance sampling technique that can often greatly improve the efficiency of an acceptance/rejection generating method. The importance sampling function is defined as piecewise constant on a set of subregions, which are obtained by adaptively partitioning the sampling region so that the variation of density values within each subregion is relatively small. The partitioning strategy is based on multiparameter optimization to estimate the maximum and minimum of the original density function in each subregion. Author (GRA)

N82-24877# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
A MONTE CARLO STUDY OF DIMENSIONALITY ASSESSMENT AND FACTOR INTERPRETATION IN PRINCIPLE COMPONENT ANALYSIS M.S. Thesis
Kenneth W. Bauer, Jr. Dec. 1981 79 p refs
(AD-A111428; AFIT/GOR/OS/81D-2) Avail: NTIS HC A05/MF A01 CSCL 12/1

This study addresses two steps in a process known as principle components analysis using Monte Carlo techniques. An analysis is presented of two popular dimensionality assessment techniques, Kaiser's criterion and Catell's Scree test. The factor interpretation issue is addressed through a regression study in which the grand mean square error between population and sample factor loading matrices is predicted. The notion of a complexity index is also introduced. Author (GRA)

N82-24878# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
AN EVALUATION OF RIDGE REGRESSION M.S. Thesis
James R. Makin Dec. 1981 105 p refs
(AD-A111204; AFIT/GOR/OS/81D-6) Avail: NTIS HC A06/MF A01 CSCL 14/1

The technique of linear regression has been applied as a tool for predicting the cost of an item based on its most important characteristics. Often these characteristics (variables) tend to be highly intercorrelated (the data are said to exhibit multicollinearity) causing least squares estimates of the regression coefficients to be unstable and possibly leading to erroneous predictions. Ridge regression, a possible remedy for the problems caused by multicollinearity proposed by Hoerl and Kennard, is a biased estimation technique which reduces the variance of estimators and provides more precision (as measured by mean square error of the coefficients) than ordinary least squares (OLS) estimators. A comparison was made between these techniques to determine when ridge regression provides better cost equation coefficient estimates than OLS as a function of the degree of multicollinearity in the data, the number of predictor variables in the model, the degree of model fit (R2), and the amount of bias (k) of the estimate. A regression analysis of both sets showed that the degree of multicollinearity and amount of bias interact in explaining the major part of the improvement (degradation) in the mean square coefficient error. GRA

66 SYSTEMS ANALYSIS

Includes mathematical modeling; network analysis; and operations research.

N82-24246# Centre National d'Etudes Spatiales, Toulouse (France).
SYSTEM ANALYSIS ON THE LEVEL OF DATA PROCESSING [ANALYSE DE SYSTEME AU NIVEAU DU TRAITEMENT DES DONNEES]
G. Raphanel *In its* The Technol. of Spaceborne Sci. Expt. 1981 p 869-885 In FRENCH (For primary document see N82-24215 15-12)
Avail: NTIS HC A99/MF A01

N82-25035*# National Aeronautics and Space Administration, Washington, D. C.
UNSOLVED PROBLEMS
In its B Stars With and Without Emission Lines, Parts 1 and 2 1982 p 231-256 (For primary document see N82-25027 15-88)
Avail: NTIS HC A23/MF A01 CSCL 12B

67 THEORETICAL MATHEMATICS

Includes topology and number theory.

N82-24879# Central Research Inst. for Physics, Budapest (Hungary).
TOWARDS COMPLETE INTEGRABILITY OF THE SELF-DUALITY EQUATIONS
P. Forgacs, Z. Horvath (Roland Eotvos Univ., Budapest), and L. Palla (Roland Eotvos Univ., Budapest) Jan. 1981 11 p refs (KFKI-1981-06; ISSN-0368-5330; ISBN-963-371-781-J) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

A solution generating method for the self-duality and the Bogomolny equations is given. The existence of an infinite parameter invariance group of these equations is pointed out. DOE

70 PHYSICS (GENERAL)

For geophysics see *46 Geophysics*. For astrophysics see *90 Astrophysics*. For solar physics see *92 Solar physics*.

N82-24880# Innsbruck Univ. (Austria). Inst. fuer Atomphysik.

SYMPOSIUM ON ATOMIC AND SURFACE PHYSICS, 1982 CONTRIBUTIONS

W. Lindinger, ed., F. Howorka, ed., T. D. Maerk, ed., and F. Egger, ed. 1982 353 p refs Symp. held in Salzburg, Austria, 7-13 Feb. 1982, sponsored in cooperation with Bundminster fuer Wissenschaft und Forschung and Landeshauptmann von Salzburg

Avail: NTIS HC A16/MF A01

Properties of ions and clusters, and ion-surface interactions were examined. The reaction kinetics of various ion interactions are focused on including fusion, neutral interactions, recombination, and collisions of excited atoms. Techniques in spectroscopy and laser physics are discussed. For individual titles, see N82-24881 through N82-24939.

N82-24881*# Colorado Univ. at Boulder.

STUDIES OF CLUSTERS IN THE GAS PHASE AND APPLICATION TO AN UNDERSTANDING OF TRANSITIONS FROM GASEOUS TO THE SURFACE AND CONDENSED STATE **c72**

A. W. Castleman, Jr. *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 1-6 refs (For primary document see N82-24880 15-70)

(Contracts NsG-2248; DE-AC02-78EV-04776; DAAG29-79-C-0133; Grant NSF ATM79-13801)

Avail: NTIS HC A16/MF A01 CSCL 20H

Studies of the structure, stability, electronic properties, and formation kinetics of small clusters were reviewed which provide information useful in furthering understanding of nucleation processes, liquid state properties, and the nature of surfaces. Using mass spectrometric coupled with various high pressure ion clustering and Stark effect-molecular beam techniques, the details of the primary clustering steps leading to the nucleation of bulk liquid from the vapor were and obtained by direct observation results are presented. T.M.

N82-24882# Innsbruck Univ. (Austria). Inst. fuer Experimentalphysik.

CLUSTER PROPERTIES STUDIED BY ELECTRON IMPACT IONIZATION **c72**

T. D. Maerk, K. Stephan, H. Helm (SRI International, Menlo Park, Calif.), J. H. Futrell (Utah Univ.), E. Maerk (Hoehere Technische Bundeslehr und Versuchsanstalt), K. I. Peterson (Colorado Univ., Boulder), A. W. Castleman, Jr. (Colorado Univ., Boulder), N. Djuric (Institute of Physics, Beograd, Jugoslavia), and A. Stamatovic (PMF Kragujevac, Jugoslavia) *In its* Symp. on Atomic Surface Phys., 1982 Contrib. 1982 p 7-18 refs (For primary document see N82-24880 15-70)

(Contract EP-78-S-02-4776)

Avail: NTIS HC A16/MF A01

Experimental studies of the properties of atomic and molecular clusters, including investigations of the dynamics of their formation and mechanisms of ionization and dissociation are reported. Results of electron impact-supersonic beam ionization experiments utilizing a double focussing mass spectrometer are presented. T.M.

N82-24883# Freiburg Univ. (West Germany). Fakultaet fuer Physik.

CHARGED WATER AND CO2 CLUSTERS **c72**

Martin Armbruster, Hellmut Haberland, and Hans-George Schindler *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 19-24 refs (For primary document see N82-24880 15-70)

Avail: NTIS HC A16/MF A01

A supersonic molecular beam source with an internal radioactive Beta emitter produces a variety of unusual positively or negatively charged cluster ions, among them the so called 'hydrated' electrons (H2O)(-) sub n. For a CO2-expansion the metastable ion CO2(-) was observed. T.M.

N82-24884# Utah Univ., Salt Lake City.

A MOLECULAR DYNAMICS STUDY OF THE COLLISION INDUCED DISSOCIATION REACTIONS OF CH4(+) AND C3H8(+) AT ELECTRON VOLT COLLISION ENERGIES **c72**

J. H. Futrell, Z. Herman (Heyrovsky Inst. of Physical Chemistry and Electrochemistry), and B. Friedrich (Heyrovsky Inst. of Physical Chemistry and Electrochemistry) *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 25-29 (For primary document see N82-24880 15-70)

Avail: NTIS HC A16/MF A01

The collision-induced-dissociation (CID) reactions of organic ions are of interest in that these phenomena are the basis of the analytical mass spectrometry technique of mass spectrometry-mass spectrometry (MS-MS). The introduction of tandem triple quadrupole MS-MS spectrometers and their recent application to analytical problems is focusing attention on CID reactions of organic ions in the 1-10 eV range rather than the kilovolt energy regime in which these reactions were generally investigated. Although a great deal is known about the reaction kinematics and mechanisms of high energy CID reactions, the low energy reactions dynamics of this class of ion-molecule collisions for organic ions is largely unexplored. The results of exploratory study and some general conclusions for low energy CID reactions are presented. T.M.

N82-24885# Centre National de la Recherche Scientifique, Orsay (France). Lab. de Physico-Chimie des Rayonnements.

RECENT EXPERIMENTS ON THE EXCITATION AND DECAY OF SMALL MOLECULAR IONS **c72**

T. R. Govers *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 30-36 refs (For primary document see N82-24880 15-70)

Avail: NTIS HC A16/MF A01

Molecular photoionization studies carried out by means of synchrotron radiation are discussed. They are examplified by two experiments: photoelectron spectroscopy dealing with vibrational autoionization in H2, and threshold photoelectron/photon coincidence studies on the unimolecular dissociation of NO(+) between 20.11 and 24.59 eV. T.M.

N82-24886# Hoehere Technische Bundeslehr- und Versuchsanstalt, Innsbruck (Austria).

ON THE METASTABLE DECAY PROCESS N2O(+*) YIELDS NO(+)+N **c72**

E. Maerk, T. D. Maerk (Innsbruck Univ.), Y. B. Kim (Innsbruck Univ.), and K. Stephan (Innsbruck Univ.) *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 37-41 refs Sponsored in part by Oesterreicher Fonds zur Foerderung der Wissenschaftlichen Forschung (For primary document see N82-24880 15-70)

Avail: NTIS HC A16/MF A01

The collision induced and unimolecular decay of N2O(+) yields NO(+) + N was studied quantitatively. It is found that the number of metastable N2O(+)* ions (produced by N2O + e yields N2O(+)*) has a lower limit of approx. 11% as compared to the stable N2O(+) ions. T.M.

N82-24887# PMF Kragujevac (Yugoslavia).

METASTABLE TRANSITIONS AS AN EVIDENCE FOR SEVERAL ION MOLECULAR REACTIONS IN SO2 AT LOW PRESSURE **c72**

A. Stamatovic and M. Miletic (IBK-Vinca) *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 42-47 refs (For primary document see N82-24880 15-70)

Avail: NTIS HC A16/MF A01

Metastable transitions were observed as Aston's peaks in the negative ion mass spectrum of SO2 (Ee=5eV, p=0,1 - 1 Pa). Studies of temperature, pressure and electron energy dependences, within the limits of used apparata are discussed. They provide information about a number of ion-molecular reactions in SO2 at low pressures, but do not resolve all of ambiguities about the origin and dissociation of negative ions with mass numbers greater than mass number of the molecular negative ion, SO2(-). T.M.

N82-24888# Innsbruck Univ. (Austria). Inst. fuer Experimentalphysik.

UNIMOLECULAR AND COLLISION INDUCED DISSOCIATION OF Ar, N2 AND ArN2 **c72**

K. Stephan and T. D. Maerk *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 48-53 refs Sponsored by Oesterreicishecher Fonds zur Foerderung der Wissenschaftlichen Forschung (For primary document see N82-24880 15-70)

Avail: NTIS HC A16/MF A01

The inflight decomposition of (ArxN2y) cluster ions was studied quantitatively using a double focussing mass-spectrometer (reversed geometry). The metastable ionic states are produced by single impact of 70 eV electrons on neutral Van der Waals molecules formed in a supersonic expansion of a Ar-N2 mixture seeded with helium. The dependence of metastable dissociation rates of cluster ions on the stagnation gas temperature prior to expansion is shown. T.M.

N82-24889# Max-Planck-Institut fuer Kernphysik, Heidelberg (West Germany).

COMPOSITION MEASUREMENTS OF STRATOSPHERIC IONS **c46**

F. Arnold *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 54-64 refs (For primary document see N82-24880 15-70)

Avail: NTIS HC A16/MF A01

Progress in the field of in-situ ion composition measurements in the Earth's atmosphere was reviewed with particular emphasis on stratospheric measurements. During recent years it became possible to measure the composition of stratospheric positive and negative ions over an extended altitude range (15-42 km) using balloon-borne ion mass spectrometers. It turned out that these measurements provide important information not only on ions but also on neutral trace gases and aerosols. Author

N82-24890# Max-Planck-Institut fuer Kernphysik, Heidelberg (West Germany).

SILICON NEGATIVE ION CHEMISTRY IN THE ATMOSPHERE: IN SITU AND LABORATORY MEASUREMENTS **c46**

A. A. Viggiano, F. Arnold (NOAA, Boulder, Colo.), D. W. Fahey, F. C. Fehsenfeld (NOAA, Boulder, Colo.), and E. E. Ferguson (NOAA, Boulder, Colo.) *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 65-69 (For primary document see N82-24880 15-70)

Avail: NTIS HC A16/MF A01

A rocket-borne mass spectrometer indicates large concentrations of negative ions above the bottom of the atmospheric atomic oxygen layer. A large majority of these ions have masses greater than 10 amu. In addition, an ion at mass 76 was observed with concentrations too large to be CO4(-). In order to explain these features, a number of reactions involving silicon oxide negative ions were measured in a flowing afterglow system. The ion SiO3(-) is produced by reaction of O3(-) and CO3(-) with SiO. The SiO3(-) ion is extremely stable and does not react measurably with NO, NO2, CO, CO2, O3 or O. Since meteroid ablation produces a large silicon input into the atmosphere, it appears possible that the ions observed at mass 76 may be SiO3(-). Possible production mechanisms for this ion as well as the heavy ions are discussed. S.L.

N82-24891# Consiglio Nazionale delle Ricerche, Rome (Italy). Ist. Metodologie Avanzate Inorganiche.

THE (e, 2e) EXPERIMENTS ON He AT INTERMEDIATE ENERGY (400-1600 eV) **c72**

R. Camilloni, R. Fantoni, A. Giardini-Guidoni (Perugia Univ.), M. Rosi, G. Stefani (Trento Univ.), and A. Zecca *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 70-74 refs (For primary document see N82-24880 15-70)

Avail: NTIS HC A16/MF A01

Ionization theories obtainable in dypole and binary (e,2e) experiments are discussed. Some data taken in asymmetric kinematics on He are presented. Experiments performed in suitably chosen kinematic conditions have provided information either on the structure of the target or on the dynamics of the interaction /1,2/. Kinematics of (e,2e) reaction are shown where the momenta of all the involved electrons are defined together with the momentum transferred. Collision dynamics are studied in different kinematic conditions to test the validity of ionization theories in a number of typical situations, such as binary impulsive or dypole geometry. In the binary (e,2e) reactions, the energy and momenta of the involved electrons chosen are high enough so that impulsive approximation is applied in describing the interaction and factorization of the cross section. S.L.

N82-24892# Austrian Research Center, Seibersdorf.

DEVIATION OF CRACKING PATTERNS AND THEIR INFLUENCE ON RGA ACCURACY **c25**

A. Breth and R. Dobrozemsky *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 75-78 Sponsored by Fonds zur Foerderung der Wissenschaftlichen Forschung, (For primary document see N82-24880 15-70)

Avail: NTIS HC A16/MF A01

Influences on the measured cracking patterns of partial pressure analysis of gases and gas mixtures and their consequences on calculated results are presented. Electron stimulated desorption of ions from adsorbates on the electrodes of the ion source normally causes a constant background signal on certain mass numbers, but a change of the surface coverage gives an unknown variation of the background during the measurement. Variation of the effective pumping speed due to reactions of gases with the hot filament causes the gas composition in the system to be altered. For some gases (e.g. CO2) the measured cracking patterns are different from the theoretically expected values for the pure gas. S.L.

N82-24893# SRI International Corp., Menlo Park, Calif.

PHOTODETACHMENT OF ELECTRONS FROM NEGATIVE IONS **c25**

J. R. Peterson *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 79-82 refs (For primary document see N82-24880 15-70)

Avail: NTIS HC A16/MF A01

The general characteristics of photodetachment are reviewed. Examples that illustrate various details of this process related to electron scattering are given. S.L.

N82-24894# IBM Watson Research Center, Yorktown Heights, N.Y.

TOWARDS A UNIFIED MODEL FOR THE FORMATION OF SPUTTERED EXCITED STATES **c76**

Roger Kelly *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 84-90 refs (For primary document see N82-24880 15-70)

Avail: NTIS HC A16/MF A01

The statistical model for the formation of sputtered excited states is tested by comparing experiment with theory for an ensemble of yields such as SiI, SiII, and SiIII, where the internal energies span a sufficiently wide interval. The electron exchange model was tested where group II metals were bombarded in ultrahigh vacuum and the yields of excited ions were unusually high relative to excited neutrals. With certain reservations, the two models may constitute limiting aspects of a single model which are valid, respectively, when electron exchange is forbidden or allowed. S.L.

N82-24895# Technische Univ., Vienna (Austria). Inst. fuer Allgemeine Physik.

ION NEUTRALIZATION AT SURFACES **c76**

P. Varga *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 91-94 refs (For primary document see N82-24880 15-70)

Avail: NTIS HC A16/MF A01

Some problems of the interaction of slow singly and multiply charged ions with surfaces are described. In particular, the neutralization processes which happens a few Angstroms in front of the surface are studied. The stepwise neutralization in a sequence of Auger-de-excitation and Auger-neutralization processes for doubly charged neon ions is demonstrated in detail. M.D.K.

N82-24896# Technische Univ., Vienna (Austria). Inst. fuer Allgemeine Physik.

MEASUREMENT OF METASTABLE FRACTIONS IN NOBLE-GAS ION BEAMS **c72**

W. Hofer, W. Vanek, P. Varga, and H. Winter *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 95-100 refs Sponsored by fonds zur Foerderung der Wissenschaftlichen Forschung (For primary document see N82-24880 15-70)

Avail: NTIS HC A16/MF A01

A method to determine metastable fractions of singly charged ion beams from the measured secondary electron energy

distribution following slow ion impact on a clean metal surface is presented. The method is also capable of working with slightly contaminated surfaces, which is of interest for practical applications. Author

N82-24897# Max-Planck-Institut fuer Plasmaphysik, Garching (West Germany).

ION SURFACE INTERACTIONS AT LOW ENERGIES c76

E. Taglauer *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 107-105 refs (For primary document see N82-24880 15-70)

Avail: NTIS HC A16/MF A01

Ion-surface interactions in the low energy range (around 1 keV) can be understood to some extent using simple models such as single two-body collision processes or undisturbed electronic energy levels. More detailed investigations show that multiple collisions, shadowing, and different neutralization processes for bulk and surface scattering have to be considered. For a complete description of the interaction a three dimensional treatment is necessary, including trajectory dependent neutralization. M.D.K.

N82-24898# Technische Univ. Munich, Garching (West Germany). Inst. fuer Festkoerperphysik.

PHOTON SIMULATED DESORPTION REVISITED c76

D. Menzel *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 106-110 refs (For primary document see N82-24880 15-70)

Avail: NTIS HC A16/MF A01

A promising new method for surface investigations is discussed: Photon stimulated desorption. The electronic excitations of adsorbate complexes on surfaces, either by electron impact or photon absorption, which can lead to repulsive states of the complex and therefore to expulsion of ions and neutrals are considered. Such processes are termed electron (or photon) stimulated desorption, ESD and PSD, respectively. Apart from the primary agent (electrons or photons), these processes are similar, and common label 'desorption induced by electronic transitions' (acronym DIET) was proposed. Desorption effects, intrinsic photoneffects, and some of the advantages of PSD over ESD are discussed. M.D.K.

N82-24899# Commissariat a l'Energie Atomique, Gif-sur-Yvette (France). Service de Physique des Atomes et des Surfaces.

QUASI-CRYSTALLINE ORGANIC LAYERS STUDIED WITH PHOTO-EMISSION AND META-EMISSION SPECTROSCOPIES c25

C. Boiziau, C. Juret, G. Lecayon, R. Nuvolone, and C. Reynaud *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 111-116 refs (For primary document see N82-24880 15-70)

Avail: NTIS HC A16/MF A01

An electropolymerized polyacrilonitrile layer (200 nm thick) was studied by M.D.S. (He (23S)) and UPS (HeI). It was shown that this layer has both insulating and conducting properties. Its electronic properties and its dielectric behavior changes appreciably after its reticulation and with the temperature. Author

N82-24900# Technische Univ., Vienna (Austria). Inst. fuer Allgemeine Physik.

CHANGES IN THE SURFACE COMPOSITION OF TiC, TaC AND WC UNDER LOW ENERGY ION BOMBARDMENT c72

H. Stoeri, G. Betz, and P. Braun *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 123-128 refs Sponsored by Fonds Austrian zur Foerderung der Wissenschaftlichen Forschung (For primary document see N82-24880 15-70)

Avail: NTIS HC A16/MF A01

Changes in the surface composition of TiC, TaC and WC under 0.5 - 5 keV Ar ion bombardment were studied by Auger Electron Spectroscopy (AES). For TaC and WC surface enrichment of Ta and W, resp., was observed, which increases with decreasing ion energy. In addition, transients in surface composition were found whenever the ion energy was changed. This can be explained in terms of depth profiling of the altered layer. For TiC no preferential sputtering effects were observed, as was concluded from the absence of transients in surface composition when the ion energy was varied. Author

N82-24901# Essen Univ. (West Germany). Fachbereic Physik.

MEMORY EFFECTS AND CLEANING OF PLASMA TUBES c75

H. G. Lergon and K. G. Mueller *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 123-128 refs Sponsored by Ministerium fuer Wissenschaft und Forschung des Landes Nordrhein-Westfalen (For primary document see N82-24880 15-70)

Avail: NTIS HC A16/MF A01

An argon plasma with a small admixture of H2O or O2 shows a memory effect in which material of the wall or material deposited there by previous discharges is released into the plasma. In contrast to the common cleaning of metallic surfaces with a hydrogen discharge, cleaning of glass surfaces with an oxygen discharge is proposed. The enrichment of special impurity species in front of a wall is also discussed. Author

N82-24902# Austrian Research Center, Seibersdorf.

LONG TIME EFFECTS IN RADIATION ENHANCED PERMEATION OF H2 THROUGH STAINLESS STEEL TUBES c26

G. Schwarzinger and R. Dobrozemsky *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 129-133 refs Sponsored by Fonds zur Foerderung der Wissenschaftlichen Forschung Austria (For primary document see N82-24880 15-70)

Avail: NTIS HC A16/MF A01

Research which gives the particulars of the influences of penetrating radiation on permeation and diffusion processes of hydrogen isotopes in stainless steel is summarized. Short time as well as long time effects were investigated. Such processes are not only of interest for the fuel inventory of fusion reactors, but also for environmental aspects (tritium release). Author

N82-24903# Innsbruck Univ. (Austria). Inst. fuer Experimentalphysik.

DIFFUSION TO THE SURFACE IN THE ANNEALING OF RADIATION DAMAGE IN INORGANIC INSULATING SOLIDS c25

W. Ritter and T. D. Maerk *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 134-140 refs (For primary document see N82-24880 15-70)

Avail: NTIS HC A16/MF A01

Absorption spectroscopy was used for the investigation of fission track radiation damage in inorganic insulating solids. By extending previous studies the characteristic absorption difference, as a function of annealing temperature and sample dimension in fluorapatite, was measured. From these studies it was possible to obtain quantitative information about the identity of the microscopic elementary processes responsible for the annealing of radiation damage induced lattice defects: the dominant annealing process for the absorbing defects is diffusion to the surface with a measured diffusion coefficient of D = (3.2 + or - 0.4) . 10 to the minus 9th power square centimeters/s (at T = 673K) perpendicular to the c-axis. Author

N82-24904# Hahn-Meitner-Institut fuer Kernforschung, Berlin (West Germany). Bereich Strahlenchemie.

INVESTIGATION OF ION MOLECULE COLLISIONS BY SPECTROSCOPIC TECHNIQUES c72

A. Ding, K. Richter, and U. Steinmetzger *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 141-143 refs (For primary document see N82-24880 15-70)

Avail: NTIS HC A16/MF A01

The use of optical techniques for the high-resolution study of low-energy ion-atom interactions in half-collision experiments is discussed. Optical selection rules allow the precise preparation of a collision complex at well defined energy and in well defined quantum numbers and the observation of its dynamic properties. Hence the very finest details of molecular interactions and their role in reactive encounters can be uncovered. As a result an ion-atom collision is experimentally decomposed into individual partial wave contributions. Their assignment and interpretation afford a decisive challenge to the experimenter and to the theory of ion-atom interactions. Author

N82-24905# SRI International Corp., Menlo Park, Calif.
A PHOTON'S VIEW OF RESONANCES IN LOW-ENERGY ION-ATOM COLLISIONS c72
H. Helm *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 144-149 refs (For primary document see N82-24880 15-70)
(Grant NSF PHY-81-12548)
Avail: NTIS HC A16/MF A01

An obstacle to the application of spectroscopic techniques to ionic species is the existence of space charge, which severely limits the ion densities obtainable. Several methods of approach used to overcome these problems are discussed. They are: (1) the addition of charges of opposite polarity, e.g., electrons or negative ions in the case of positive particles; (2) the use of ion traps; (3) pulsed measurements; and (4) laser techniques. M.D.K.

N82-24906# Innsbruck Univ. (Austria).
RECENT SPECTROSCOPIC AND LASER RELEVANT INVESTIGATIONS Progress Report c36
F. Howorka, I. Kuen, W. Federer, B. Jelenkovic (Inst. of Physics, Beograd, Yugoslavia), F. H. Futrell (Utah Univ.), K. Rozsa (Central Research Inst. for Physics), A. Ding (Hahn-Meitner Institut fuer Kernsforschung), and R. N. Varney *In its* Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 150-153 refs (For primary document see N82-24880 15-70)
Avail: NTIS HC A16/MF A01

Spectroscopic and laser relevant investigations comprising three main topics are summarized. The topics discussed are: (1) study of the luminescence arising from the interaction of ions with atoms and molecules, and of atoms sputtered from a solid target; (2) combined mass spectrometric and light spectroscopic space resolved studies of the excitation of radiative levels of various charge states in a hollow cathode discharge operated in a variety of discharge gases and mixtures; and (3) study of the influence of the addition of foreign atoms and molecules on the characteristics of He-Ne laser. Author

N82-24907# Freiburg Univ. (West Germany). Fakultaet fuer Physik.
ANALYSIS OF DISCRETE AND CONTINUOUS LASER INDUCED FLUORESCENCE SPECTRA OF THE A(1) SIGMA(+) SUB U-X(1) SIGMA(+) SUB G BAND SYSTEM OF SR SUB 2 c36
G. Gerber and R. Moeller *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 168-171 refs (For primary document see N82-24880 15-70)
Avail: NTIS HC A16/MF A01

Laser induced fluorescence spectra of the gaseous Sr2 excimer molecule were measured. The spectra contain discrete molecular fluorescence series, regularly modulated continuous fluorescence and an unstructured continuum. Analysis of the molecular line spectra yields for the first time Dunham coefficients for the ground state and the excited state. Using the intensity distribution of the modulated continuum which is associated with bound-free transitions the repulsive potential of the ground state up to 3000 cm to the minus 1 power above the dissociation limit was determined. The unstructured continuum can be analyzed as due to two types of continuous fluorescence. The dissociation energy of Sr2 was determined to D sub e(x) = 965 plus or minus 45 cm to the minus 1 power. Author

N82-24908# Stanford Univ., Calif. Dept. of Applied Physics.
COHERENT ANTI-STOKES RAMAN SPECTROSCOPY (CARS) IN A PULSED MOLECULAR BEAM c34
R. L. Byer, M. D. Duncan, F. Koenig, and P. Oesterlin *In* Innsbruck Univ. Symp. on Automic and Surface Phys., 1982 Contrib. 1982 p 168-171 refs (For primary document see N82-24880 15-70)
Avail: NTIS HC A16/MF A01

CARS spectra of C2H2 were taken in a pulsed molecular beam at various distances from the nozzle. Measurements of the rotational temperature show the cooling of the gas due to the expansion. Measured temperatures were always higher than calculated. A possible explanation for this discrepancy is condensation in the beam. For molecules with a complicated rotational spectrum as C2H2 the cooling in the beam reduces the number of lines drastically, which can simplify the analysis of data. Author

N82-24909# Technische Univ., Vienna (Austria). Inst. fuer Allgemeine Physik.
BASIC PROBLEMS ASSOCIATED WITH THE INTERPRETATION OF THE FLUOESCENCE SPECTRA IN DOPPLER-SHIFT LASER SPECTROSCOPY c36
K. Thomsen, W. Husinsky, and G. Betz *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 178-183 refs (For primary document see N82-24880 15-70)
Avail: NTIS HC A16/MF A01

The influence of power broadening and the interpretation of the measured fluorescence spectra as being proportional to the flux or density in Doppler shift laser fluorescence spectroscopy using CW-dye laser excitation are discussed. Power broadening was found to be negligible for the measurement of energy spectra of sputtered species and in the low energy regime (below several 1000 m/s) the measured fluorescence signal of Na was found to be proportional to the flux. Author

N82-24910# Central Research Inst. for Physics, Budapest (Hungary).
He-Ne LASER IN HOLLOW CATHODE DISCHARGE c36
K. Rozsa, M. Janossy, F. Howorka (Innsbruck Univ.), and I. Kuen (Innsbruck Univ.) *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 184-189 refs Sponsored by Fonds zur Foerderung der Wissenschaflichen forschung (For primary document see N82-24880 15-70)
Avail: NTIS HC A16/MF A01

The output power of the 632.8 nm He-Ne laser was investigated experimentally in a hollow cathode discharge. The sputtered metal increases the laser power; the highest output power was found in a Cu hollow cathode at about 2 torr Ne and 6 torr He. In this pressure region one single longitudinal mode can be achieved without any selective element placed inside the laser resonator. The effects of the sputtered metal due to the quenching of the lower laser level, are discussed. Author

N82-24911# Innsbruck Univ. (Austria). Inst. fuer Experimentalphysik.
VACUUM ULTRAVIOLET SPECTROSCOPY OF HOLLOW CATHODE DISCHARGES c36
I. Kuen and F. Howorka *In its* Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 190-194 refs Sponsored by Fonds zur Foerderung der Wissenschaflichen Forschung (For primary document see N82-24880 15-70)
Avail: NTIS HC A16/MF A01

A radially moveable hollow cathode discharge was used to determine the light intensity distribution of atomic and ionic resonance lines in a discharge in He, Ne, Ar, Kr, Xe, H2, O2, N2, and He - Xe in the wavelength region 30 to 160 nm. A narrow collimator was attached to the anode end of the discharge thus allowing the measurement of the line intensity distribution with a radial resolution of 0.1 mm. A 0.2 m VUV monochromator with a holographic, osmium coated grating blazed for 121.6 nm was used, with an open 17-stage multiplier as a detector. The monochromator was differentially pumped by a turbomolecular pump. Results are presented. Author

N82-24912# Central Research Inst. for Physics, Budapest (Hungary).
CHARGED PARTICLE SCATTERING IN A MAGNETIC AND A LASER FIELD AND NONLINEAR BREMSSTRAHLUNG c72
J. Bergou, F. Ehlotzky (Innsbruck Univ.), and S. Varro *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 195-199 refs (For primary document see N82-24880 15-70)
Avail: NTIS HC A16/MF A01

The transition amplitude of charged-particle scattering by a background potential V(r) in the simultaneous presence of a magnetic and a laser field is determined in closed form. Conservation laws, selection rules and field dependences are discussed in detail. The connection with previous more restricted treatments as well as possible applications are also established. Author

N82-24913# Central Research Inst. for Physics, Budapest (Hungary).
BEHAVIOUR OF A MODEL ATOM IN A UNIFORM

MAGNETIC AND A LASER FIELD **c72**
J. Bergou and J. Ehlotzky (Innsbruck Univ.) *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 200-204 refs (For primary document see N82-24880 15-70)
Avail: NTIS HC A16/MF A01

The three-dimensional anisotropic charged harmonic oscillator in an uniform magnetic and in a laser field is an exactly soluble quantum-mechanical problem. The solution was derived in a purely algebraic manner. The transition from the atomic spectrum to Landau type spectrum, the effect of the laser field as well as possible resonances are discussed. Author

N82-24914# International Atomic Energy Agency, Vienna (Austria). Nuclear Data Section.
COLLISION DATA FOR DIAGNOSTICS OF MAGNETICALLY CONFINED PLASMAS **c75**
Konstantinos Katsonis *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 205-215 refs (For primary document see N82-24880 15-70)
Avail: NTIS HC A16/MF A01

The use of atomic collision data for diagnostics of magnetically confined plasmas is briefly reviewed. The availability of these data is presented. Data useful for beam heating and modelling are also considered. Priorities are suggested for the most needed data. Author

N82-24915# Georgia Inst. of Tech., Atlanta. School of Physics.
BASIC MICROSCOPIC THEORY OF CHEMICAL REACTIONS IN DENSE GASES **c25**
In Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 216-220 refs (For primary document see N82-24880 15-70)
(Grant AF-AFOSR-80-0055)
Avail: NTIS HC A16/MF A01

The first basic theory of ion-ion recombination in a dense gas is outlined. The rate alpha of the process is shown to be determined by the competition between transport and reaction. The theory provides alpha as a function of gas density, ion-density and time. Results are provided for the rate of homogeneous recombination of (Kr(+) - F(-)) and (Xe(+) - Cl(-)) systems in rare gases. Time dependent rates are provided and interesting insights emerge. Geminate recombination is also discussed. Author

N82-24916# Rennes Univ. (France). Lab. d'Aerothermique.
THE YIELD OF METASTABLE NITROGEN ATOM IN DISSOCIATIVE RECOMBINATION OF N2(+) IONS **c72**
J. L. Queffelec, B. Rowe (Centre National de la Recherche Scientifique, Meudon, France), and M. Morlais *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 221-226 refs (For primary document see N82-24880 15-70)
Avail: NTIS HC A16/MF A01

The branching ratio of N(2D) and N(2P) atoms formed in the reaction N2(+) + e yields N + N was studied using absorbtion technics. N2(+) was formed by charge exchange with Ar(+) ions in an argon plasma jet. It was shown that N(2D) is one of the major products of the dissociative recombination. Author

N82-24917# Kaiserslautern Univ. (West Germany). Fachbereich Physik.
TIME SCALES IN ION-MOLECULE SCATTERING **c72**
F. Linder *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 227-230 refs (For primary document see N82-24880 15-70)
Avail: NTIS HC A16/MF A01

The dynamical behavior of the collision systems are discussed with respect to time effects. Most examples are taken from ion-molecule scattering, the collision energy being easily varied, making tuning the collision time versus the different eigentimes of the system possible. N.W.

N82-24918# Freie Univ., Berlin (West Germany).
DETERMINATION OF THE COMPLETE DENSITY MATRIX OF HEI 3P AFTER HE(+)-NE COLLISIONS WITH IMPACT PARAMETER SELECTION **c72**
H. Winter and H. J. Andrae (Muenster Univ.) *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 227-230 refs Sponsored by DFG Sonderforschungsbereich 161 (For primary document see N82-24880 15-70)
Avail: NTIS HC A16/MF A01

A 'quasi-coincidence' method is applied. The density matrix components of HeI 3p excited by He(+)-Ne collisions were determined, with impact parameter selection at energies from 2.3 to 20 keV. Author

N82-24919# Technische Univ., Vienna (Austria). Inst. fuer Allgemeine Physik.
STATE SELECTIVE ELECTRON CAPTURE STUDIED FOR QUASI-ONE-ELECTRON COLLISION SYSTEMS **c72**
Hannspeter Winter *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 239-244 refs (For primary document see N82-24880 15-70)
Avail: NTIS HC A16/MF A01

Recent theoretical and experimental work on state-selective electron capture in collisions of singly and doubly charged ions with Li atoms is reviewed. Such studies are suited to check theoretical predictions on electron capture into multiply charged ions from H(1s) atoms. Two direct applications for diagnostics of thermonuclear fusion plasmas are described. Author

N82-24920# Technische Univ., Vienna (Austria). Inst. fuer Allgemeine Physik.
ABSOLUTE INITIAL-TO-FINAL STATE-SELECTIVE ONE-ELECTRON CAPTURE CROSS SECTIONS FOR (Ne)+2-Xe COLLISIONS **c72**
A. Brazuk and H. Winter *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 245-250 refs Sponsored in cooperation with the Austrian Fonds zur Foerderung der Wissenschaftlichen Forschung and the International Atomic Energy Agency (For primary document see N82-24880 15-70)
Avail: NTIS HC A16/MF A01

An optical attenuation technique adapted for the VUV spectral region was used to determine total one-electron capture cross sections for collisions of ground state and metastable doubly charged Neon ions with Xe atoms at 40 keV impact energy. The cross sections turned out to be considerably different which can be explained by a larger probability for transfer ionization for the metastable primary ions. The fractions of both ion states were derived and used to determine initial-to-final state-selective one-electron capture cross sections for production of several NeII states. Author

N82-24921# Freiburg Univ. (West Germany). Fakultaet fuer Physik.
SOME SIMPLE ION-MODULE REACTIONS MEASURED WITH GUIDED BEAMS **c72**
Christoph Schliar *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 251-256 Sponsored by Deutsche Forschungsgemeinschaft (For primary document see N82-24880 15-70)
Avail: NTIS HC A16/MF A01

RF-ion optics in a 'guided beam' tandem mass spectrometer is reviewed. Experiments and theoretical evidence for reaction mechanisms in the ion-molecule system, N(+)+CO resp. C(+)+NO, and D(+)3+H2, are discussed. Author

N82-24922# Ceskoslovenska Akademie Ved, Prague. Inst. of Physical Chemistry and Electrochemistry.
ION-MOLECULE REACTION DYNAMICS: ITS DEVELOPMENT IN FIFTEEN YEARS **c72**
Zdenek Herman *In* Innsbruck Univ. Symp. on Atomic and Surface Phys. 1982 Contrib. 1982 p 257-261 refs (For primary document see N82-24880 15-70)
Avail: NTIS HC A16/MF A01

The development of the field of the dynamics of ion-molecule reactions is reviewed and its achievements are illustrated.Author

N82-24923# Innsbruck Univ. (Austria). Inst. fuer Experimentalphysik.
RECENT DEVELOPMENTS IN THE INVESTIGATION OF THE ENERGY DEPENDENCES OF ION-NEUTRAL-REACTIONS IN DRIFT EXPERIMENTS **c72**
W. Lindinger, H. Villinger, F. Howorka, A. Saxer, W. Dobler, St. Niccolini, R. Richter, and H. Ramler *In its* Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 262-267 refs Sponsored

by the Oesterreichischer Fonds zur Foerderung der Wissenschaftlichen Forschung. (For primary document see N82-24880 15-70)
Avail: NTIS HC A16/MF A01

Results on the energy dependencies of branching ratios, and of the state distribution of ionic reaction products, on the influence of the ionic excitation, on the reactivities of ions with neutrals, and on the investigation of associative reactions in drift tubes are reported. Author

N82-24924# Innsbruck Univ. (Austria). Inst. fuer Experimentalphysik.
PROTON TRANSFER AND ISOTOPIC EXCHANGE REACTIONS c72
H. Villinger, J. H. Futrell (Utah Univ., Salt Lake City), M. J. Henchman (Brandeis Univ., Waltham, Mass.), F. Howorka, A. Saxer, R. Richter, and W. Lindinger *In its* Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 268-271 refs Sponsored by the Oesterreichischer Fonds zur Foerderung der Wissenschaftlichen Forschung. (For primary document see N82-24880 15-70)
Avail: NTIS HC A16/MF A01

The energy dependences of the exothermic proton transfer from ArH(+) to various neutrals was investigated in the energy regime from thermal to approx. 1 eV. All rate coefficients obtained are fast (within a factor of two of the Langevin or ADO limiting values) and show only slight energy dependences. From the equilibrium [ArH(+)]/[H3(+)] in Ar-H2 mixtures a difference of the proton affinities between Ar and H2 of Delta Pa = 0.55 eV was obtained. The exchange reactions H(+) + D2 yields HD + D(+) and D(+) + H2 yields HD + H(+) show energy dependences which are in full agreement with theoretical predictions taking into account statistical factors and the energetics of the reactions. Author

N82-24925# University Coll. of Wales, Aberystwyth. Dept. of Physics.
THE SEPARATE REACTIONS OF THE (P SUB 3/2)2 AND (P SUB 1/2)2 GROUND STATES OF Kr+ WITH A NUMBER OF GASES FROM 0.04 eV TO SEVERAL eV c72
T. T. C. Jones, K. Birkinshaw, J. D. C. Jones, and N. D. Twiddy *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 272-277 refs (For primary document see N82-24880 15-70)
Avail: NTIS HC A16/MF A01

The separate reactions of (P sub 3/2)2 and (P sub 1/2)2 ground states of Kr(+) with O2, CO, N2O and OCS were investigated over the mean relative kinetic energy range from 0.04 eV to several eV using a Flow-Drift-Tube apparatus. The results were interpreted in terms of transitions between states of the reaction intermediate that correlate adiabatically to either the reactants or change transfer products. Author

N82-24926# Paris-Sud Univ., Orsay (France). Lab. de Resonance Electronique et Ionique.
THERMAL ENERGY CHARGE TRANSFER REACTIONS: KINETIC AND INTERNAL ENERGY OF THE PRODUCTS c72
R. Derai, G. Mauclaire, and R. Marx *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 278-284 refs (For primary document see N82-24880 15-70)
Avail: NTIS HC A16/MF A01

Non dissociative charge transfer reactions from the (P sub 3/2)2 ground state of Ar(+), Kr(+) and Xe(+) with several small molecules were investigated at near thermal energy. In most of these systems, a substantial kinetic energy release was observed. The internal energy of the products was determined. It is shown that molecular products are usually formed in high vibrational levels of the electronic ground state with a rather narrow vibrational distribution. Author

N82-24927# Orleans Univ. (France). Centre de Recherche en Physique de l'Environment.
KINETIC STUDY OF SYSTEMS INCLUDING NH+2 (NH+2 + CH3NH2 AND NH+2 + CH3CH) c72
R. Thomas, J. Barassin, and A. Barassin *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 285-290 refs (For primary document see N82-24880 15-70)
Avail: NTIS HC A16/MF A01

The kinetic energy dependence of the total rate constant and of the branching ratio of reaction involving NH(+)2 with CH3OH and CH3NH2 were determined in the energy range 0.05 to 1 eV by the drift tube mass spectrometer technique using 0.5 Torr of He as buffer gas. Reaction schemes are proposed for the two systems and rate coefficients are determined for each step. Author

N82-24928# Trento Univ., Povo (Italy). Inst. per la Ricerca Scientifica e Technologica.
THE ENERGY DEPENDENCES OF REACTIONS OF C+, CH+ AND CH2+ WITH VARIOUS NEUTRALS c75
St. Niccolini, D. Bassi, S. Iannotta, H. Villinger, R. Richter, A. Saxer, and W. Lindinger *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 291-294 refs Prepared in cooperation with Innsbruck Univ. (For primary document see N82-24880 15-70)
Avail: NTIS HC A16/MF A01

The energy dependences of the rate coefficients for the reactions of CH sub n with O2 and NO were investigated with n = 0,1,2. A drift experiment in the energy range from 0.1 to approximately 1 eV was performed. The product distributions as a function of the relative energy between ions and reactants was determined for some of the reactions. J.D.

N82-24929# Innsbruck Univ. (Austria). Inst. fuer Experimentalphysik.
A SELECTED ION FLOW TUBE INVESTIGATION ON THE QUENCHING OF N2 (V NOT EQUAL TO O) BY VARIOUS NEUTRALS c76
W. Dobler, F. Howorka, and W. Lindinger *In its* Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 295-298 refs Sponsored by Oesterreichischer Fonds zur Foerderung der Wissenschaftlichen Forschung (For primary document see N82-24880 15-70)
Avail: NTIS HC A16/MF A01

A selected ion flow tube (SIFT) was used to determine rate coefficients for the quenching of the vibration of N2(+) (v not = o) by Ne, O2, N2, NO, and CO2. Values of 0.045, 1.2, 5, equal to or < 0.3, and < 1 were obtained. The values are all in units of 0.0000000001 cu cm per 0.1 second. J.D.

N82-24930# Innsbruck Univ. (Austria). Inst. fuer Experimentalphysik.
KINETIC ENERGY DEPENDENCES OF THE BRANCHING RATIOS OF THE REACTIONS He+, Ne+ AND Ar+ + H2O c72
W. Dobler, W. Lindinger, and F. Howorka *In its* Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 299-303 refs Sponsored by the Fonds zur Foerderung der Wissenschaftlichen Forschung (For primary document see N82-24880 15-70)
Avail: NTIS HC A16/MF A01

The selected ion flow drift tube (SIFDT) was used for measuring rate constants and product distributions for the reactions of He(+), Ne(+), and Ar(+) with H2O. The rate constants are independent of energy. The branching ratios of the same reactions at room temperature were determined. Reaction results from the SIFDT technique are compared with results obtained using other techniques. J.D.

N82-24931# Freiburg Univ. (West Germany). Fakulaet fuer Physik.
CALCULATIONS OF REACTIVE CROSS SECTIONS AND RATE COEFFICIENTS FOR ISOTOPIC VARIANTS OF THE H+ + H2 SYSTEM IN THE ENERGY RANGE 2meV - 1.8 eV c72
Dieter Gerlich *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 304-309 refs (For primary document see N82-24880 15-70)
Avail: NTIS HC A16/MF A01

The proton deuteron exchange reactions of H(+) + D2, D(+) + H2, H(+) + HD, and D(+) + HD were studied using a dynamically biased statistical theory. Above 0.5 eV, complex formation and decay probabilities were defined with the help of trajectories calculated on a DIM energy surface. At lower kinetic energies, the induced dipole and quadrupole interaction

was taken into account. The cross sections and thermal rate coefficients are in reasonable agreement with experimental values measured with different techniques. J.D.

N82-24932# Georgia Inst. of Tech., Atlanta. School of Physics.
ION MOBILITIES AND ION-ATOM INTERACTION POTENTIALS **c72**
Ian R. Gatland *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 310-317 refs Sponsored by ONR (For primary document see N82-24880 15-70)
Avail: NTIS HC A16/MF A01

The techniques for measuring the mobilities of ions in gases, relating interaction potentials to mobilities, and determining potentials from experimental mobilities are reviewed. Applications are presented for positive alkali ions and negative halogen ions in inert gases. Author

N82-24933# Innsbruck Univ. (Austria). Inst. fuer Experimentalphysik.
MOBILITIES OF CH+ SUB n EQUALS 0,1,2,3) IN He AND OF CH3+ IN Ar **c72**
K. Peska, G. Sejkora, H. Stoeri (Technische Univ., Vienna), F. Egger, H. Ramler, M. Kriegel, and W. Lindinger *In its* Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 318-321 refs Sponsored by the Oesterreichischer Fonds zur Foerderung der Wissenschaftlichen Forschung (For primary document see N82-24880 15-70)
Avail: NTIS HC A16/MF A01

A slow flow drift tube was adapted to allow for the measurement of ion mobilities by recording the arrival time spectra of the ions, which are pulsed by two separate grids. Results on the E/N dependences of the reduced mobilities of CH sub n (+) (n = 0,1,2,3) in He and of CH3(+) in Ar are presented. J.D.

N82-24934# Innsbruck Univ. (Austria). Inst. fuer Experimentalphysik.
LATERAL DIFFUSION OF MASS IDENTIFIED IONS: EXPERIMENTAL **c72**
G. Sejkora, M. Groessl (Firma Balzers, Liechtenstein), H. Helm (SRI International, Menlo Park, Calif.), M. Hilchenbach, M. T. Elford (Australian National Univ., Canberra), W. Lindinger, and T. D. Maerk *In its* Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 322-326 refs Sponsored by the Oesterreichischer Fonds zur Foerderung der Wissenschaftlichen Forschung (For primary document see N82-24880 15-70)
Avail: NTIS HC A16/MF A01

The design and construction of an apparatus suitable for the quantitative study of lateral diffusion of mass identified ions are described. Previous studies and experimental techniques are reviewed and compared with the present system. Properties of a new stable low current ion source are reported. Author

N82-24935# Commissariat a l'Energie Atomique, Gif-sur-Yvette (France). Service de Physique des Atomes et des Surfaces.
COLLISIONS OF RYDBERG ATOMS **c72**
F. Gounand *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 327-332 refs (For primary document see N82-24880 15-70)
Avail: NTIS HC A16/MF A01

Some general aspects of collisions involving Rydberg atoms are discussed. The l changing collisions of Rb (nF) states colliding with various atomic targets (He, Ar, Xe, and Rb in its ground state) and the use of Rydberg atoms to study resonant collisions are discussed in more detail. J.D.

N82-24936# Freiburg Univ. (West Germany). Fakultaet fuer Physik.
VARIOUS PROBES OF CONFIGURATION INTERACTION IN BARIUM RYDBERG STATES **c72**
W. Sandner, K. A. Safinya (Schlumberger-Doll Research, Ridgefield, Conn.), F. Gounand (Commissariat a l'Energie Atomique, Gif-sur-Yvette, France), and T. F. Gallagher (SRI International, Menlo Park, Calif.) *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 333-337 refs (For primary document see N82-24880 15-70)
Avail: NTIS HC A16/MF A01

Methods independent of multichannel quantum defect theory (MQDT) for determining the composition of configuration mixed wave functions in bound and autoionizing Rydberg states are evaluated. The potential use of typical Rydberg wave function properties for studying the composition of a configuration mixed bound state wave function is demonstrated. The use of an interference free excitation scheme combined with results from electron spectroscopy for studying autoionizing states is demonstrated to enable the MQDT study even in the case of complex multichannel configuration interaction. J.D.

N82-24937# Commissariat a l'Energie Atomique, Gif-sur-Yvette (France). Centre d'Etudes Nucleaires.
IONIZATION BY EXCITED RARE GAS ATOMS OF SHORT LIFETIMES **c72**
A. Pesnelle *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 338-347 refs (For primary document see N82-24880 15-70)
Avail: NTIS HC A16/MF A01

Interactions between radiatively excited rare gas atoms of low n, and ground state atoms or molecules in discharges and in crossed beam experiments are described. Studies of He(*)-rare gas systems and their comparison with the existing theoretical prediction are discussed. J.D.

N82-24938# Freiburg Univ. (West Germany).
DIFFERENTIAL CROSS SECTION FOR Ne(P3 SUB 0) AND Ne(P3 SUB 2) SCATTERED FROM GROUND STATE NEON **c72**
W. Beyer, H. Haberland, and D. Hausamann *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 348-353 refs Sponsored by the Deutsche Forschungsgemeinschaft (For primary document see N82-24880 15-70)
Avail: NTIS HC A16/MF A01

The differential elastic cross sections for electronically excited Ne(3P sub 0) and Ne(3P sub 2) from ground state Ne atoms at thermal collision energies were measured separately. Potentials for Ne(3P sub 0) + Ne were determined and the height of the intermediate potential maxima for Ne(3P sub 2) + Ne were estimated to 25 meV. By preparing Ne(3P sub 2) in special M sub J states, scattering in single Omega molecular state was observed. Author

N82-24939# Commissariat a l'Energie Atomique, Gif-sur-Yvette (France). Centre d'Etudes Nucleaires.
COLLISIONAL IONIZATION OF RUBIDIUM EXCITED STATES **c72**
M. Cheret, L. Barbier, W. Lindinger (Innsbruck Univ.), and R. Deloche *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 354-357 refs (For primary document see N82-24880 15-70)
Avail: NTIS HC A16/MF A01

A mass analysis of ions formed in a Rb cell where 5p and more excited s or d states were created by lasers is described. In addition to associative ionization by collision of the s or d level with a ground atom, Penning ionization by collision between excited and 5p atoms plays an important role. Author

N82-24940# Technische Hogeschool, Delft (Netherlands). Lab. of Engineering Mechanics.
THE MOTION OF A BODY OF REVOLUTION ROLLING WITHOUT SLIDING ON A HORIZONTAL PLANE
A. D. dePater Nov. 1981 44 p refs
(WTHD-139) Avail: NTIS HC A03/MF A01

The motion of a body, e.g., a hoop or a disk symmetrical with respect to a plane, perpendicular to the axis of revolution, is analyzed. It is shown that the general solution of the equations of motion can be found by an extension of the concept of cyclic coordinates and by means of the phase plane method. Damping decreases angular velocity, and in a given plane, a range of stationary points in the vertical axis is traversed while system energy decreases. After the stability boundary is passed, a point of the body shows a slight vertical motion, but does not rotate around the axis. Observation of a rolling coin confirms predictions. Author (ESA)

71 ACOUSTICS

Includes sound generation, transmission and attenuation.

For noise pollution see *45 Environment Pollution*.

N82-24941*# George Washington Univ., Washington, D.C.
NONLINEAR THEORY OF SHOCKED SOUND PROPAGATION IN A NEARLY CHOKED DUCT FLOW
M. K. Myers and A. J. Callegari (Advanced Analytical Research, Inc., Princeton, N.J.) Apr. 1982 70 p refs
(Contracts NCC1-14; NAS1-15636)
(NASA-CR-3549; NAS 1.26:3549) Avail: NTIS HC A04/MF A01 CSCL 20A

The development of shocks in the sound field propagating through a nearly choked duct flow is analyzed by extending a quasi-one dimensional theory. The theory is applied to the case in which sound is introduced into the flow by an acoustic source located in the vicinity of a near-sonic throat. Analytical solutions for the field are obtained which illustrate the essential features of the nonlinear interaction between sound and flow. Numerical results are presented covering ranges of variation of source strength, throat Mach number, and frequency. It is found that the development of shocks leads to appreciable attenuation of acoustic power transmitted upstream through the near-sonic flow. It is possible, for example, that the power loss in the fundamental harmonic can be as much as 90% of that introduced at the source. Author

N82-24942*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
AEROACOUSTIC PERFORMANCE OF AN EXTERNALLY BLOWN FLAP CONFIGURATION WITH SEVERAL FLAP NOISE SUPPRESSION DEVICES
Daniel J. McKinzie, Jr. May 1982 30 p refs
(NASA-TP-1995; E-573; NAS 1.60:1995) Avail: NTIS HC A03/MF A01 CSCL 20A

Small scale model acoustic experiments were conducted to measure the noise produced in the flyover and sideline planes by an engine under the wing externally blown flap configuration in its approach attitude. Broadband low frequency noise reductions as large as 9 dB were produced by reducing the separation distance between the nozzle exhaust plane and the flaps. Experiments were also conducted to determine the noise suppression effectiveness in comparison with a reference configuration of three passive types of devices that were located on the jet impingement surfaces of the reference configuration. These devices produced noise reductions that varied up to 10 dB at reduced separation distances. In addition, a qualitative estimate of the noise suppression characteristics of the separate devices was made. Finally static aerodynamic performance data were obtained to evaluate the penalties incurred by these suppression devices. The test results suggest that further parametric studies are required in order to understand more fully the noise mechanisms that are affected by the suppression devices used. M.G.

N82-24943# Texas Univ. at Arlington. Applied Research Labs.
A STUDY OF THE BROADBAND PARAMETRIC ACOUSTIC ARRAY
John M. Huckabay 4 Jan. 1982 246 p refs
(Contract N00024-79-C-6358)
(AD-A111746; ARL-TR-82-6) Avail: NTIS HC A11/MF A01 CSCL 17/1

The characteristics of the broadband parametric acoustic array were studied as a function of primary frequency directivity. The secondary sound field of the baseband modulation products is considered. The primary transmissions are produced by physically realizable sources, and the broadband parametric array for nonplane wave fields is developed. A general solution for the parametric array for nonplane wave fields is presented as the superposition of primary field components. An experimental study of the broadband parametric array which provides data with variations in experimental parameters and an emphasis on the behavior as a function of primary directivity is presented. The results for low amplitude primary signals generally confirm the theoretical predictions. An extreme sensitivity to the sidelobe structure in the primary off-axis transfer function is noted in the frequency at the spectral peak of the secondary power spectra. It is indicated that high amplitude primary signals envelope distortion due to finite amplitude effects in the primary signal and causes spectral distortion in the secondary signals. The spectral distortion is greatest on-axis where the frequency at the spectral peak is reduced. E.A.K.

N82-24944# Texas Univ. at Arlington. Applied Research Labs.
AN ANALYSIS OF DEEP OCEAN SOUND ATTENUATION AT VERY LOW FREQUENCIES
Karl C. Focke, Stephen K. Mitchell, and Claude W. Horton, Sr. 6 Jan. 1982 33 p refs
(Contract N00014-80-C-0490)
(AD-A111295; ARL-TM-82-1) Avail: NTIS HC A03/MF A01 CSCL 20/1

The attenuation coefficient of low frequency, deep ocean acoustic waves is computed for various assumptions regarding the depth profile and the frequency dependence of the scatterers. The calculations are made for a realistic velocity profile by means of a perturbation technique proposed by Guthrie. It is shown that excellent agreement with experimental data is obtained when the attenuation function is independent of frequency and decreases exponentially with depth of 200-500 m. A surface value of 0.11 dB/km gives a good agreement with the date. At frequencies below 50 Hz the attenuation in the water column is comparable to the attenuation in the sediments for the lowest order normal modes. Author (GRA)

N82-24945# Fondazione Ugo Bordoni, Rome (Italy).
ACOUSTICS: PRESENT AND FUTURE POTENTIAL IN SEVERAL APPLICATION FIELDS [L'ACUSTICA: POSSIBILITA ATTUALI E PROSPETTIVE FUTURE IN DIVERSI CAMPI DI APPLICAZIONE]
Giovanni Ibba Oct. 1981 27 p In ITALIAN
(FUB-22-1981) Avail: NTIS HC A03/MF A01

Applications of acoustics to several fields are reviewed. The characteristics of the human ear, the applications of infrasound and ultrasounds, noise hazard problems, and voice recognition and synthesis, are discussed. Author (ESA)

N82-24946# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
GENERATION OF NOISE BY TURBULENCE
Robert Legendre 1981 35 p refs In FRENCH; ENGLISH summary Report will also be announced as translation (ESA-TT-763)
(ONERA-P-1981-3; ISSN-0078-379X) Avail: NTIS HC A03/MF A01

The notion of noise source is elaborated, distinguishing between turbulent agitation, which is a cause, and acoustic agitation which is a minor effect or subproduct whose essential particularity is its propagation at the speed of sound. This allows for a precise definition of noise, derived from acoustic potential and apart from pseudo-noise linked to turbulence. The equation, valid for this potential, is established by an almost complete elimination of state variables and is linearized. This enables a study of convection and refraction effects and shows that generated noise is in proportion to the density relative variation rate. A model of anisotropic turbulence inside a shear flow is proposed. Its use shows that the noise generated inside a vortex tube is proportional to the square of the circulation. Application of the findings to interpretation of noise measurements in wind tunnels, e.g. aircraft noise predictions, is discussed. An extension of the method in order to include noise near obstacles is outlined. Author (ESA)

N82-24947# Technische Physische Dienst TNO-TH, Delft (Netherlands).
EXPERIMENTS ON SOUND RADIATION FROM PROPELLER BLADES
K. Verhulst and A. deBruijn 17 Aug. 1981 41 p refs
(TPD-908-725; TDCK-75537) Avail: NTIS HC A03/MF A01

The effect of blade damping and air bubbles on cavitation noise radiation, and the damping effect of an antisinging edge were studied. Completely flat cunial and aluminum blades were

used. One cunial blade had a viscoelastic sandwich layer. Cavitation was simulated by steam injection. The antisinging edge and viscoelastic layer have little effect. Aluminum reduces total sound power. When the distance of the bubble screen to the steam injection source is less than half a wavelength, radiated sound power is greatly reduced. Author (ESA)

N82-24948# Technische Physische Dienst TNO-TH, Delft (Netherlands).
TEST FACILITY FOR MULTIDIRECTIONAL SOUND TRANSFER THROUGH RESILIENT ELEMENTS UNDER STATIC LOAD
J. W. Verheij 21 May 1980 10 p refs
(Contracts A72/KM/003; A75/KM/004)
(TPD-008-835/1; TDCK-75135) Avail: NTIS HC A02/MF A01

A test facility and method for characterizing sound transfer properties are described. A resilient mounting is clamped between two blocks which vibrate as rigid bodies in the frequency range of interest. The upper block is on the machine side of the mounting and serves as an excitation block. The lower block determines the force which would be exerted by the mounting on a high impedance seating, i.e., the blocked force. By a proper combination of excitation block and exciter configuration one of the six excitation components is made very strong, whereas the others are suppressed. The blocked forces and couples are derived from accelerations of the terminating block. Author (ESA)

N82-24949# Technische Physische Dienst TNO-TH, Delft (Netherlands).
MEASURING MULTI-DIRECTIONAL STRUCTURE-BORNE SOUND TRANSFER THROUGH A FLUID FILLED AND PRESSURIZED BELLOWS OR FLEXIBLE HOSE
J. W. Verheij 2 Dec. 1980 8 p refs
(Contracts A72/KM/003; A75/KM/004)
(TPD-008-835/2; TDCK-75137) Avail: NTIS HC A02/MF A01

A test facility for characterizing multidirectional sound transfer properties is described. A flexible bellows is clamped between two blocks which vibrate as rigid bodies in the frequency range studied. The upper block is on the machine side of the mounting and serves as an excitation block. The lower block determines the force which would be exerted by the bellows on a high impedance pipe system, i.e., the blocked force. An annular block between two bellows the lower of which is connected to a heavy foundation, eliminates fluid borne sound transfer during tests. Transfer functions can be measured for separate excitation by each of six orthogonal translations and rotations.
Author (ESA)

N82-24950# Physics Lab. RVO-TNO, The Hague (Netherlands). Research Group 7: Acoustics.
FLOW NOISE
H. A. J. Rijnja Aug. 1981 42 p refs
(Contract A74/KM/036)
(PHL-1981-28; TDCK-75516) Avail: NTIS HC A03/MF A01

Literature on theoretical and experimental investigations of water flowing along a wall with flush mounted hydrophones is reviewed, and ways of reducing flow noise are outlined. At frequencies $>$ 100 Hz, the spectrum slopes -9 db per octave. Sound pressure level increases by 18 to 28 db when the speed is doubled. If f D $<$ U (f is frequency, D is hydrophone size and U is tow velocity) the sensitivity of the hydrophone to flow noise decreases by 6 to 12 db per octave, increasing the slope of the noise spectrum to between -15 and -20 db per octave. Because of the extreme insensitivity of large hydrophones to pseudosound at high frequencies, the very low radiation field component of the flow noise dominates the flow induced noise perceived by large hydrophones. Flow noise can be suppressed by: increasing hydrophone size to several times the largest spatial wavelength that is likely to occur; keeping hydrophones away from the turbulent boundary layer; and making the surface of the hydrophone array as smooth as possible. Roughness on the order of 0.1 mm causes excessive noise. Author (ESA)

N82-24951# National Aerospace Lab., Amsterdam (Netherlands). Fluid Dynamics Div.
THE NLR/NATIONAL GAS TURBINE ESTABLISHMENT (NGTE) JOINT PROGRAM ON THE MEASUREMENT OF ATTENUATION AND IMPEDANCE IN ACOUSTIC FLOW DUCT FACILITIES
T. Zandbergen (National Gas Turbine Estab.) and D. L. Martlew 17 Mar. 1981 37 p refs Submitted for Publication
(NLR-TR-81032-U; NGTE-Memo-M81006) Avail: NTIS HC A03/MF A01

Acoustic measurement methods based on (A) inferring impedance information from insertion loss data and (B) direct measurement of impedance by the two microphone method, using pure tone excitation, are compared Method A finds impedance values that best predict the measured insertion loss spectra, using multimodal theory of sound propagation in the duct by trial and error. In (B) insertion loss is computed from measured impedance. Tests on liner panels show that the derivation of inferred impedance from attenuation measurements is coarse, through capable of generating design rules. Direct impedance measurements must include the effects of high intensity broadband sound, flow, boundary layers, and nonuniformities over the area of duct linings. Author (ESA)

N82-24952# Wyle Labs., Inc., El Segundo, Calif.
COMMUNITY NOISE ASSESSMENT MANUAL: ACOUSTICAL SURVEY OF A COMMUNITY
Jul. 1981 319 p refs
(Contract EPA-68-01-4694)
(PB82-106196) Avail: NTIS HC A14/MF A01 CSCL 20A

A comprehensive and computerized system for assessing the noise problems of a community and plans for a noise control strategy for its abatement are provided. The technical instructions and guidelines needed by municipal authorities to carry out an initial noise survey are presented. This survey will determine average noise levels and major noise sources for the community as a whole. It can be used in planning noise reduction measures to benefit the entire community or a substantial portion thereof.
GRA

72 ATOMIC AND MOLECULAR PHYSICS

Includes atomic structure and molecular spectra.

N82-24953*# National Aeronautics and Space Administration. Pasadena Office, Calif.
MEANS AND METHOD FOR CALIBRATING A PHOTON DETECTOR UTILIZING ELECTRON-PHOTON COINCIDENCE
Patent Application
Santosh K. Srivastava, inventor (to NASA) (JPL, California Inst. of Tech., Pasadena) Filed 15 Mar. 1982 17 p
(Contract NAS7-100)
(NASA-Case-NPO-15644-1; US-Patent-Appl-SN-358088) Avail: NTIS HC A02/MF A01 CSCL 20H

An arrangement for calibrating a photon detector particularly applicable for the ultraviolet (UV) and vacuum ultraviolet (VUV) regions is based on electron photon coincidence utilizing crossed electron beam-atom beam collisions. Atoms are excited by electrons which lose a known amount of energy and scatter with a known remaining energy, while the excited atoms emit photons of known radiation. Electrons of the known remaining energy scattered in a particular direction are separated from other electrons and are sensed and counted. Photons emitted in a direction related to the particular direction of scattered electrons are detected by a detector to serve as a standard. Each of the electrons is used to initiate the measurement of a time interval which terminate with the arrival of a photon exciting the photon detector. NASA

N82-24954*# National Aeronautics and Space Administration. Goddard Inst. for Space Studies, New York.
COLLISIONAL EXCITATION OF INTERSTELLER MOLECULES: AMMONIA
Sheldon Green Greenbelt, Md. Dec. 1981 48 p refs
(NASA-TM-83869; NAS 1.15:83869) Avail: NTIS HC A03/MF A01 CSCL 20H

Theoretical rate constants are presented for excitation of

NH3 by collisions with He. The lowest 22 levels of ortho-NH3 and the lowest 16 levels of para-NH3 are considered at kinetic temperatures of 15 to 300 K. Author

N82-24955# Naval Surface Weapons Center, White Oak, Md. Research and Technology Dept.

FILAMENTATION INSTABILITY OF A RELATIVISTIC HOLLOW ELECTRON BEAM Final Report

Hans S. Uhm and J. G. Siambis Sep. 1981 38 p refs
(AD-A111198; AD-F500002; NSWC/TR-81-385) Avail: NTIS HC A03/MF A01 CSCL 20/7

The filamentation instability properties of a relativistic hollow electron beam confined in axial flow by a uniform magnetic field in a pipe are investigated via the Vlasov-Maxwell equations. The instability is found to have two side-bands, one with a spectrum of positive wavenumbers k and the other with a spectrum of negative wavenumbers. The spectral point k=0, associated with the diokotron instability, is excluded from the filamentation instability's two unstable sidebands. Only in the limit of zero axial beam flow, the diokotron instability becomes asymptotically part of the filamentation instability spectrum. In this limit the filamentation instability's two sidebands merge asymptotically and symmetrically toward the diokotron instability spectral point, k=0, in agreement with the basic driving physical mechanisms and geometry configurations for these two distinct and different instabilities. GRA

N82-24956# Naval Research Lab., Washington, D. C.

TRANSVERSE BEAM DYNAMICS IN THE MODIFIED BETATRON

D. P. Chernin and P. Sprangle 1 Mar. 1982 46 p refs Submitted for publication
(RR0110941)
(AD-A111682; NRL-MR-4687) Avail: NTIS HC A03/MF A01 CSCL 20/7

The linearized equations governing the motion of the center of a beam about its equilibrium position in a modified betatron, as well as equations governing the motion of an individual particle about the beam center, are presented and solved. Self field effects, including toroidal hoop stresses and wall image forces, are included in the analysis. All fields, both self and applied, are assumed to be azimuthally symmetric but are allowed to have arbitrary time dependences. The solutions to the equations of motion are analyzed for stability and conditions for stability are obtained. Further study of the solutions illustrates two phenomena of experimental interest: (1) the unavoidable traversal of a finite 'instability gap' in parameter space during acceleration; and (2) the adiabatic increase in the amplitude of the betatron oscillations during removal of the toroidal magnetic field, prior to beam ejection. By careful design, the effects of these phenomena can be reduced to insignificant levels in an actual accelerator.
Author (GRA)

N82-24957# Naval Research Lab., Washington, D. C. Plasma Physics Div.

DYNAMICS OF A ROTATING PROTON LAYER ALONG A MAGNETIC RAMP Final Report

J. Golden, J. A. Pasour, C. A. Kapetanakos, S. J. Marsh (Sachs-Freeman Associates, Bowie, Md.), and D. E. Pershing (Jaycor, Inc., Alexandria, Va.) 31 Dec. 1981 57 p refs
(Contract EX-77-A-34-1013; RR0110941)
(AD-A111349; NRL-MR-4699) Avail: NTIS HC A04/MF A01 CSCL 20/7

The dynamics of a rotating proton layer containing 2 - 6 x 10 to the 16th power protons of 1 1.5 MeV energy propagating in vacuum along a ramp magnetic field have been studied experimentally and by computer simulation. The layer is produced by passing the annular proton pulse produced by an Inverse Reflex Tetrode (IRT) through a magnetic cusp. The diamagnetic self-magnetic field (as high as 1.6 times the applied field) and the radial oscillations of the layer are monitored. The axial velocity of the pulse is determined, and a maximum of 1.7 is obtained for the ratio of azimuthal to axial velocity. The layer has also been propagated along the ramp in the presence of a neutral gas cloud with pressure approximately greater than 0.1 Torr. Computer simulation of the experiment uses an axisymmetric particle-in-cell code that includes self- and external- Bz and Br magnetic fields and the inductive E theta electric field. Calculated contour maps of the particle and current densities of the beam at selected times are presented. The computer particle density profile, the ratio v theta/vz, and the magnitude of the diamagnetic signals are in qualitative agreement with the observations. Author (GRA)

N82-24958# Los Alamos Scientific Lab., N. Mex.

REALIGNMENT OF THE ACCELERATOR

A. Nakach 1981 7 p refs
(Contract W-7405-eng-36)
(DE82-003203; LA-TR-81-38) Avail: NTIS HC A02/MF A01

The parameters for three operation points during injection were determined. The importance of the wave number VX on shape and dimension of the acceptance is illustrated. Realignment of the Saturn to correct an 8 mm defect in the closed orbit is described. The improved beam alignment is shown. E.A.K.

N82-24959# Los Alamos Scientific Lab., N. Mex.

REALIGNMENT AND CHARACTERIZATION OF AN ACCELERATOR BY OBSERVATIONS OF A BEAM

1981 20 p refs
(Contract W-7405-eng-36)
(DE82-003202; LA-TR-81-39) Avail: NTIS HC A02/MF A01

The correction and the realignments of Saturn are confirmed. The corrections allow the residual orbit to be brought at mean energy to values less than 4 mm, provided that the error in reading remains on the order of a millimeter and the displacement errors on the order of + - -2 mm. The need for realignment to be closer to the low values can become a frequent one, and at least a radial automation would be desirable, in connection with a telecommand unit, if the price is not prohibitive. The wave number chosen here is (MU)/sub x/ = 3.66 = (MU)/sub z/. The amplitudes of the closed orbit vary considerably at this wave number and it would actually be necessary to introduce the real value existing at the moment of measurement and of realignment. DOE

N82-24960# Central Research Inst. for Physics, Budapest (Hungary).

ANISOTROPIC THREE-FLUID MODEL FOR HEAVY ION REACTIONS

I. Lovas, Jozsef Zimanyi, Laszlo P. Csernai (Johann-Wolfgang-Goethe-Univ., Frankfurt am Main, West Germany), and Walter Greiner (Johann-Wolfgang-Goethe-Univ., Frankfurt am Main, West Germany) May 1981 8 p refs
(DE81-700604; KFKI-1981-39; ISSN-0368-5330; ISBN-963-371-820-1) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

The nucleons taking part in heavy ion reaction are considered as a three-fluid system. The first and second components correspond to the nucleons of the target and the projectile, while the thermalized nucleons produced in the course of the collision belong to the third component. Making use of the Boltzmann equation, hydrodynamical equations are derived which yield also the anisotropy of the momentum distribution. The equation of state for anisotropic nuclear matter is derived from a field theoretical model in the mean field approximation. DOE

N82-24961# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of High Energies.

COMPLETE DESTRUCTION OF HEAVY NUCLEI BY HADRONS AND NUCLEI

K. D. Tolstov 1980 6 p refs Submitted for publication
(JINR-E-1-80-552) (US Sales Only) HC A02/MF A01; DOE Depository Libraries

The total disintegration of Ag and Pb nuclei and 4 He, 12 C nuclei with a momentum of 4.5 GeV/c per nucleon is considered. It is shown that nucleons are mainly emitted, and there is no residual nucleus the mass of which is comparable to that of the primary nucleus. The probability of total nucleus disintegration is considered as a function of projectile energy and the mass. The multiplicity, energy, and emission angle of particles are considered as well. It is shown that the density of nuclear matter in the overlap zone of colliding nuclei exceeds the usual one by a factor of approximately 4. A comparison is made with interaction models. A conclusion is drawn of the collective interaction mechanism (perhaps, of the shock wave type) of particle ejection from the target nucleus at the first

stage of interaction and of explosive decay of the residual nucleus at the next one. DOE

N82-24962# Atomic Energy Research Inst., Seoul (South Korea).
STUDY OF MATERIAL SCIENCE BY NEUTRON SCATTERING
H. J. Kim, B. K. Yoon, B. C. Cheon, C. Y. Lee, and C. S. Kim 1980 39 p refs In KOREAN; ENGLISH summary
(KAERI-435/RR-168/80) Avail: NTIS (US Sales Only) HC A03/MF A01; DOE Depository Libraries

To develop accurate methods of texture measurement in metallic materials by neutron diffraction, (100), (200), (111) and (310) pole figures were measured for the oriented silicon steel sheet. Correction methods for neutron absorption and extinction effects are being studied. For quantitative analysis of texture of polycrystalline material with a cubic structure, a software was developed to calculate inverse pole figures for arbitrary direction specified in the specimen as well as pole figures for arbitrary chosen crystallographic planes from three experimental pole figures. The calculation of three dimensional orientation distribution function, the evaluation of errors in the quantitative analysis of texture, and the study of N-H...O hydrogen bond in amino acid by observing molecular motions using neutron inelastic scattering are planned. The neutron inelastic scattering spectrum of L-Serine was completed at 1000 K and over the energy transfer range of 20-150 meV. DOE

N82-24963# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics.
A CLASSICAL STATISTICAL MODEL OF HEAVY ION COLLISION. PART 1: THE BASIC FORMULAE
R. Schmidt and J. Teichert (Technische Univ., Dresden) 1980 7 p refs In ENGLISH; RUSSIAN summary
(JINR-E-4-80-527-Pt-1) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

The basic equations of a classical statistical model of heavy ion collisions are reviewed. The relative motion of the two nuclei is described by a Newton type equation of motion including frictional forces. The mass transfer between the two nuclei is treated dynamically. The statistical fluctuations around the classical mean values of the trajectory are obtained from a Fokker-Planck equation. The total distribution function is used to obtain various multidifferential cross sections of heavy ion collisions. DOE

N82-24964# Lyon Univ. (France). Inst. de Physique Nucleaire.
AXIAL POLARIZABILITY OF NUCLEONS AND NUCLEI
M. Ericson and A. Figureau Feb. 1981 10 p refs
(DE81-700232; LYCEN-8117) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

The part of the static nuclear axial polarizability arising from the nucleonic excitations is derived from the low energy expansion of the pi N amplitude. It is shown that the contribution of the delta intermediate state, though dominant, does not saturate the nucleonic response. A similar effect, though more pronounced, is known to occur for the magnetic susceptibility. DOE

N82-24965# Israel Atomic Energy Commission, Beersheba. Nuclear Research Centre.
STUDY OF THE ION-MOLECULE REACTION IN A MICROWAVE PLASMA OF PROPYLENE M.S. Thesis - Ben-Gurion Univ.
Uzi Carmi Jul. 1980 106 p refs In HEBREW; In HEBREW; ENGLISH summary
(DE81-700477; NRCN-490) Avail: NTIS HC A06/MF A01

Microwave plasma of propylene and of argon-propylene mixture were sampled by a quadrupole mass spectrometer. The composition of the plasma was investigated as a function of external parameters such as: pressure, initial concentration of gases, microwave power and sampling position. Three main paths are determined for the pyrolysis and polymerization of propylene, that constitute the rate determining step. Rate constants are determined for the various reactions between propylene and the intermediates. An overall rate constant for the disappearance of propylene is determined. It is found that this constant is dependent on the initial gas concentration and on plasma pressure. DOE

N82-24966# Amsterdam Univ. (Netherlands).
PHOTOFRAGMENTATION OF METAL HALIDES Ph.D. Thesis
N. J. A. vanVeen 1980 162 p refs
(INIS-mf-6325) Avail: NTIS (US Sales Only) HC A08/MF A01; DOE Depository Libraries

Photodissociation cross section consists of two contributions arising from transitions to excited states of total electronic angular momentum. From the inversion of the absorption continua potential energy curves of the excited states can be constructed in the Franck-Condon region. Three thallium halides, TlI, TlBr and TlCl are studied at various wavelengths covering the near utlraviolet region. DOE

N82-24967# Vrije Universiteit, Amsterdam (Netherlands).
ELECTRONIC STRUCTURE OF PALLADIUM-HYDROGEN AND PALLADIUM-DEUTERIUM ROM DEHAAS-VAN ALPHEN EXPERIMENTS Ph.D. Thesis
Willem Jurrianus Venema 26 Nov. 1980 194 p refs In DUTCH; ENGLISH summary
(INIS-mf-6394) Avail: NTIS (US Sales Only) HC A09/MF A01; DOE Depository Libraries

The electronic structure of a transition metal-hydrogen interstitial alloy was studied. Data on the Fermi surface and on the electron scattering rates of palladium-hydrogen and palladium-deuterium are obtained from de Haas-van Alphen experiments using a torque balance spectrometer and a field modulation spectrometer. It is suggested that the isotope effect observed in the superconductive transition temperature of concentrated PdH(D) sub (X) is, at least partly, due to a difference in the electronic structure of PdH sub (X) compared to that of PdD sub (x). DOE

N82-24968# Technische Universitaet, Munich (West Germany). Lehrstuhl fuer Raumfahrttechnik.
AN ELECTROMAGNETIC ACCELERATOR
P. Lell, E. Igenbergs, and H. Kuczera Dec. 1981 27 p refs
(TUM-LRT-TB-81/12) Avail: NTIS HC A03/MF A01

An electromagnetic accelerator which accelerates masses of up to 1 gr to velocities between 10 and 300 m/sec is described. The theoretical model is compared with experimental results. A primary coil generates a time varying magnetic field flux, which induces a current in a metallic disk in front of the coil. This secondary current in the disk generates a magnetic field flux, opposite in direction to the flux in the primary coil. The resulting repulsive force between the primary coil and the disk accelerates the disk. Tests show that if all geometric parameters are kept constant, velocity is a function of the charging voltage U. If U is set with + or - 0.1% accuracy, velocity is reproducible within 1%. Velocity of 300 m/sec is reached within 8 to 10 mm in 5 to 20 microsec. Author (ESA)

N82-24969# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Electron Physics.
THE 50 MeV RACETRACK MICROTRON AT THE ROYAL INSTITUTE OF TECHNOLOGY, STOCKHOLM
S. Rosander, M. Sedlacek, O. Wernholm, and H. Babic (Zagreb Univ., Yugoslavia) Dec. 1981 46 p refs
(TRITA-EPP-81-06; ISSN-0348-7539) Avail: NTIS HC A03/MF A01

The development, construction and operation of a pulsed 50 MeV two sector racetrack microtron is described. The machine has internal electron gun injection and uses a biperiodic standing wave linac for acceleration. Electrons with energies between 3 MeV and 55 MeV can be extracted. Orbital stability is ensured by an inverted magnetic field along the fronts of the main magnets. Author (ESA)

N82-24881*# Colorado Univ. at Boulder.
STUDIES OF CLUSTERS IN THE GAS PHASE AND APPLICATION TO AN UNDERSTANDING OF TRANSITIONS FROM GASEOUS TO THE SURFACE AND CONDENSED STATE
A. W. Castleman, Jr. *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 1-6 refs (For primary document see N82-24880 15-70)
(Contracts NsG-2248; DE-AC02-78EV-04776; DAAG29-79-C-0133; Grant NSF ATM79-13801)
Avail: NTIS HC A16/MF A01 CSCL 20H

N82-24882# Innsbruck Univ. (Austria). Inst. fuer Experimentalphysik.
CLUSTER PROPERTIES STUDIED BY ELECTRON IMPACT IONIZATION
T. D. Maerk, K. Stephan, H. Helm (SRI International, Menlo Park, Calif.), J. H. Futrell (Utah Univ.), E. Maerk (Hoehere Technische Bundeslehr und Versuchsanstalt), K. I. Peterson (Colorado Univ., Boulder), A. W. Castleman, Jr. (Colorado Univ., Boulder), N. Djuric (Institute of Physics, Beograd, Jugoslavia), and A. Stamatovic (PMF Kragujevac, Jugoslavia) *In its* Symp. on Atomic Surface Phys., 1982 Contrib. 1982 p 7-18 refs (For primary document see N82-24880 15-70)
(Contract EP-78-S-02-4776)
Avail: NTIS HC A16/MF A01

N82-24883# Freiburg Univ. (West Germany). Fakultaet fuer Physik.
CHARGED WATER AND CO2 CLUSTERS
Martin Armbruster, Hellmut Haberland, and Hans-George Schindler *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 19-24 refs (For primary document see N82-24880 15-70)
Avail: NTIS HC A16/MF A01

N82-24884# Utah Univ., Salt Lake City.
A MOLECULAR DYNAMICS STUDY OF THE COLLISION INDUCED DISSOCIATION REACTIONS OF CH4(+) AND C3H8(+) AT ELECTRON VOLT COLLISION ENERGIES
J. H. Futrell, Z. Herman (Heyrovsky Inst. of Physical Chemistry and Electrochemistry), and B. Friedrich (Heyrovsky Inst. of Physical Chemistry and Electrochemistry) *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 25-29 (For primary document see N82-24880 15-70)
Avail: NTIS HC A16/MF A01

N82-24885# Centre National de la Recherche Scientifique, Orsay (France). Lab. de Physico-Chimie des Rayonnements.
RECENT EXPERIMENTS ON THE EXCITATION AND DECAY OF SMALL MOLECULAR IONS
T. R. Govers *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 30-36 refs (For primary document see N82-24880 15-70)
Avail: NTIS HC A16/MF A01

N82-24886# Hoehere Technische Bundeslehr- und Versuchsanstalt, Innsbruck (Austria).
ON THE METASTABLE DECAY PROCESS N2O(+*) YIELDS NO(+)+N
E. Maerk, T. D. Maerk (Innsbruck Univ.), Y. B. Kim (Innsbruck Univ.), and K. Stephan (Innsbruck Univ.) *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 37-41 refs Sponsored in part by Oesterreicher Fonds zur Foerderung der Wissenschaftlichen Forschung (For primary document see N82-24880 15-70)
Avail: NTIS HC A16/MF A01

N82-24887# PMF Kragujevac (Yugoslavia).
METASTABLE TRANSITIONS AS AN EVIDENCE FOR SEVERAL ION MOLECULAR REACTIONS IN SO2 AT LOW PRESSURE
A. Stamatovic and M. Miletic (IBK-Vinca) *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 42-47 refs (For primary document see N82-24880 15-70)
Avail: NTIS HC A16/MF A01

N82-24888# Innsbruck Univ. (Austria). Inst. fuer Experimentalphysik.
UNIMOLECULAR AND COLLISION INDUCED DISSOCIATION OF Ar, N2 AND ArN2
K. Stephan and T. D. Maerk *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 48-53 refs Sponsored by Oesterreicishecher Fonds zur Foerderung der Wissenschaftlichen Forschung (For primary document see N82-24880 15-70)
Avail: NTIS HC A16/MF A01

N82-24891# Consiglio Nazionale delle Ricerche, Rome (Italy). Ist. Metodologie Avanzate Inorganiche.
THE (e, 2e) EXPERIMENTS ON He AT INTERMEDIATE ENERGY (400-1600 eV)
R. Camilloni, R. Fantoni, A. Giardini-Guidoni (Perugia Univ.), M. Rosi, G. Stefani (Trento Univ.), and A. Zecca *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 70-74 refs (For primary document see N82-24880 15-70)
Avail: NTIS HC A16/MF A01

N82-24896# Technische Univ., Vienna (Austria). Inst. fuer Allgemeine Physik.
MEASUREMENT OF METASTABLE FRACTIONS IN NOBLE-GAS ION BEAMS
W. Hofer, W. Vanek, P. Varga, and H. Winter *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 95-100 refs Sponsored by fonds zur Foerderung der Wissenschaftlichen Forschung (For primary document see N82-24880 15-70)
Avail: NTIS HC A16/MF A01

N82-24900# Technische Univ., Vienna (Austria). Inst. fuer Allgemeine Physik.
CHANGES IN THE SURFACE COMPOSITION OF TiC, TaC AND WC UNDER LOW ENERGY ION BOMBARDMENT
H. Stoeri, G. Betz, and P. Braun *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 123-128 refs Sponsored by Fonds Austrian zur Foerderung der Wissenschaftlichen Forschung (For primary document see N82-24880 15-70)
Avail: NTIS HC A16/MF A01

N82-24904# Hahn-Meitner-Institut fuer Kernforschung, Berlin (West Germany). Bereich Strahlenchemie.
INVESTIGATION OF ION MOLECULE COLLISIONS BY SPECTROSCOPIC TECHNIQUES
A. Ding, K. Richter, and U. Steinmetzger *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 141-143 refs (For primary document see N82-24880 15-70)
Avail: NTIS HC A16/MF A01

N82-24905# SRI International Corp., Menlo Park, Calif.
A PHOTON'S VIEW OF RESONANCES IN LOW-ENERGY ION-ATOM COLLISIONS
H. Helm *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 144-149 refs (For primary document see N82-24880 15-70)
(Grant NSF PHY-81-12548)
Avail: NTIS HC A16/MF A01

N82-24912# Central Research Inst. for Physics, Budapest (Hungary). 02(Innsbruck Univ.)
CHARGED PARTICLE SCATTERING IN A MAGNETIC AND A LASER FIELD AND NONLINEAR BREMSSTRAHLUNG
J. Bergou, F. Ehlotzky, and S. Varro *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 195-199 refs (For primary document see N82-24880 15-70)
Avail: NTIS HC A16/MF A01

N82-24913# Central Research Inst. for Physics, Budapest (Hungary).
BEHAVIOUR OF A MODEL ATOM IN A UNIFORM MAGNETIC AND A LASER FIELD
J. Bergou and J. Ehlotzky (Innsbruck Univ.) *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 200-204 refs (For primary document see N82-24880 15-70)
Avail: NTIS HC A16/MF A01

N82-24916# Rennes Univ. (France). Lab. d'Aerothermique.
THE YIELD OF METASTABLE NITROGEN ATOM IN DISSOCIATIVE RECOMBINATION OF N2(+) IONS
J. L. Queffelec, B. Rowe (Centre National de la Recherche Scientifique, Meudon, France), and M. Morlais *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 221-226 refs (For primary document see N82-24880 15-70)
Avail: NTIS HC A16/MF A01

N82-24917# Kaiserslautern Univ. (West Germany). Fachbereich Physik.
TIME SCALES IN ION-MOLECULE SCATTERING

F. Linder *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 227-230 refs (For primary document see N82-24880 15-70)
Avail: NTIS HC A16/MF A01

N82-24918# Freie Univ., Berlin (West Germany).
DETERMINATION OF THE COMPLETE DENSITY MATRIX OF HEI 3P AFTER HE(+)-NE COLLISIONS WITH IMPACT PARAMETER SELECTION
H. Winter and H. J. Andrae (Muenster Univ.) *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 227-230 refs Sponsored by DFG Sonderforschungsbereich 161 (For primary document see N82-24880 15-70)
Avail: NTIS HC A16/MF A01

N82-24919# Technische Univ., Vienna (Austria). Inst. fuer Allgemeine Physik.
STATE SELECTIVE ELECTRON CAPTURE STUDIED FOR QUASI-ONE-ELECTRON COLLISION SYSTEMS
Hannspeter Winter *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 239-244 refs (For primary document see N82-24880 15-70)
Avail: NTIS HC A16/MF A01

N82-24920# Technische Univ., Vienna (Austria). Inst. fuer Allgemeine Physik.
ABSOLUTE INITIAL-TO-FINAL STATE-SELECTIVE ONE-ELECTRON CAPTURE CROSS SECTIONS FOR (Ne)+2-Xe COLLISIONS
A. Brazuk and H. Winter *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 245-250 refs Sponsored in cooperation with the Austrian Fonds zur Foerderung der Wissenschaftlichen Forschung and the International Atomic Energy Agency (For primary document see N82-24880 15-70)
Avail: NTIS HC A16/MF A01

N82-24921# Freiburg Univ. (West Germany). Fakultaet fuer Physik.
SOME SIMPLE ION-MODULE REACTIONS MEASURED WITH GUIDED BEAMS
Christoph Schliar *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 251-256 Sponsored by Deutsche Forschungsgemeinschaft (For primary document see N82-24880 15-70)
Avail: NTIS HC A16/MF A01

N82-24922# Ceskoslovenska Akademie Ved, Prague. Inst. of Physical Chemistry and Electrochemistry.
ION-MOLECULE REACTION DYNAMICS: ITS DEVELOPMENT IN FIFTEEN YEARS
Zdenek Herman *In* Innsbruck Univ. Symp. on Atomic and Surface Phys. 1982 Contrib. 1982 p 257-261 refs (For primary document see N82-24880 15-70)
Avail: NTIS HC A16/MF A01

N82-24923# Innsbruck Univ. (Austria). Inst. fuer Experimentalphysik.
RECENT DEVELOPMENTS IN THE INVESTIGATION OF THE ENERGY DEPENDENCES OF ION-NEUTRAL-REACTIONS IN DRIFT EXPERIMENTS
W. Lindinger, H. Villinger, F. Howorka, A. Saxer, W. Dobler, St. Niccolini, R. Richter, and H. Ramler *In its* Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 262-267 refs Sponsored by the Oesterreichischer Fonds zur Foerderung der Wissenschaftlichen Forschung. (For primary document see N82-24880 15-70)
Avail: NTIS HC A16/MF A01

N82-24924# Innsbruck Univ. (Austria). Inst. fuer Experimentalphysik.
PROTON TRANSFER AND ISOTOPIC EXCHANGE REACTIONS
H. Villinger, J. H. Futrell (Utah Univ., Salt Lake City), M. J. Henchman (Brandeis Univ., Waltham, Mass.), F. Howorka, A. Saxer, R. Richter, and W. Lindinger *In its* Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 268-271 refs Sponsored by the Oesterreichischer Fonds zur Foerderung der Wissenschaftlichen Forschung. (For primary document see N82-24880 15-70)
Avail: NTIS HC A16/MF A01

N82-24925# University Coll. of Wales, Aberystwyth. Dept. of Physics.
THE SEPARATE REACTIONS OF THE (P SUB 3/2)2 AND (P SUB 1/2)2 GROUND STATES OF Kr+ WITH A NUMBER OF GASES FROM 0.04 eV TO SEVERAL eV
T. T. C. Jones, K. Birkinshaw, J. D. C. Jones, and N. D. Twiddy *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 272-277 refs (For primary document see N82-24880 15-70)
Avail: NTIS HC A16/MF A01

N82-24926# Paris-Sud Univ., Orsay (France). Lab. de Resonance Electronique et Ionique.
THERMAL ENERGY CHARGE TRANSFER REACTIONS: KINETIC AND INTERNAL ENERGY OF THE PRODUCTS
R. Derai, G. Mauclaire, and R. Marx *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 278-284 refs (For primary document see N82-24880 15-70)
Avail: NTIS HC A16/MF A01

N82-24927# Orleans Univ. (France). Centre de Recherche en Physique de l'Environment.
KINETIC STUDY OF SYSTEMS INCLUDING NH+2 (NH+2 + CH3NH2 AND NH+2 + CH3CH)
R. Thomas, J. Barassin, and A. Barassin *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 285-290 refs (For primary document see N82-24880 15-70)
Avail: NTIS HC A16/MF A01

N82-24930# Innsbruck Univ. (Austria). Inst. fuer Experimentalphysik.
KINETIC ENERGY DEPENDENCES OF THE BRANCHING RATIOS OF THE REACTIONS He+, Ne+ AND Ar+ + H2O
W. Dobler, W. Lindinger, and F. Howorka *In its* Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 299-303 refs Sponsored by the Fonds zur Foerderung der Wissenschaftlichen Forschung (For primary document see N82-24880 15-70)
Avail: NTIS HC A16/MF A01

N82-24931# Freiburg Univ. (West Germany). Fakulaet fuer Physik.
CALCULATIONS OF REACTIVE CROSS SECTIONS AND RATE COEFFICIENTS FOR ISOTOPIC VARIANTS OF THE H+ + H2 SYSTEM IN THE ENERGY RANGE 2meV - 1.8 eV
Dieter Gerlich *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 304-309 refs (For primary document see N82-24880 15-70)
Avail: NTIS HC A16/MF A01

N82-24932# Georgia Inst. of Tech., Atlanta. School of Physics.
ION MOBILITIES AND ION-ATOM INTERACTION POTENTIALS
Ian R. Gatland *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 310-317 refs Sponsored by ONR (For primary document see N82-24880 15-70)
Avail: NTIS HC A16/MF A01

N82-24933# Innsbruck Univ. (Austria). Inst. fuer Experimentalphysik.
MOBILITIES OF CH+ SUB n EQUALS 0,1,2,3) IN He AND OF CH3+ IN Ar
K. Peska, G. Sejkora, H. Stoeri (Technische Univ., Vienna), F. Egger, H. Ramler, M. Kriegel, and W. Lindinger *In its* Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 318-321 refs Sponsored by the Oesterreichischer Fonds zur Foerderung der Wissenschaftlichen Forschung (For primary document see N82-24880 15-70)
Avail: NTIS HC A16/MF A01

N82-24934# Innsbruck Univ. (Austria). Inst. fuer Experimentalphysik.

LATERAL DIFFUSION OF MASS IDENTIFIED IONS: EXPERIMENTAL
G. Sejkora, M. Groessl (Firma Balzers, Liechtenstein), H. Helm (SRI International, Menlo Park, Calif.), M. Hilchenbach, M. T. Elford (Australian National Univ., Canberra), W. Lindinger, and T. D. Maerk *In its* Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 322-326 refs Sponsored by the Oesterreichischer Fonds zur Foerderung der Wissenschaftlichen Forschung (For primary document see N82-24880 15-70)
Avail: NTIS HC A16/MF A01

N82-24935# Commissariat a l'Energie Atomique, Gif-sur-Yvette (France). Service de Physique des Atomes et des Surfaces.
COLLISIONS OF RYDBERG ATOMS
F. Gounand *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 327-332 refs (For primary document see N82-24880 15-70)
Avail: NTIS HC A16/MF A01

N82-24936# Freiburg Univ. (West Germany). Fakultaet fuer Physik.
VARIOUS PROBES OF CONFIGURATION INTERACTION IN BARIUM RYDBERG STATES
W. Sandner, K. A. Safinya (Schlumberger-Doll Research, Ridgefield, Conn.), F. Gounand (Commissariat a l'Energie Atomique, Gif-sur-Yvette, France), and T. F. Gallagher (SRI International, Menlo Park, Calif.) *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 333-337 refs (For primary document see N82-24880 15-70)
Avail: NTIS HC A16/MF A01

N82-24937# Commissariat a l'Energie Atomique, Gif-sur-Yvette (France). Centre d'Etudes Nucleaires.
IONIZATION BY EXCITED RARE GAS ATOMS OF SHORT LIFETIMES
A. Pesnelle *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 338-347 refs (For primary document see N82-24880 15-70)
Avail: NTIS HC A16/MF A01

N82-24938# Freiburg Univ. (West Germany).
DIFFERENTIAL CROSS SECTION FOR Ne(P3 SUB 0) AND Ne(P3 SUB 2) SCATTERED FROM GROUND STATE NEON
W. Beyer, H. Haberland, and D. Hausamann *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 348-353 refs Sponsored by the Deutsche Forschungsgemeinschaft (For primary document see N82-24880 15-70)
Avail: NTIS HC A16/MF A01

N82-24939# Commissariat a l'Energie Atomique, Gif-sur-Yvette (France). Centre d'Etudes Nucleaires.
COLLISIONAL IONIZATION OF RUBIDIUM EXCITED STATES
M. Cheret, L. Barbier, W. Lindinger (Innsbruck Univ.), and R. Deloche *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 354-357 refs (For primary document see N82-24880 15-70)
Avail: NTIS HC A16/MF A01

73 NUCLEAR AND HIGH-ENERGY PHYSICS

Includes elementary and nuclear particles; and reactor theory.

For space radiation see *93 Space Radiation*.

N82-24970# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Computing Techniques and Automation.
TWO-DIMENSIONAL LORENTZ-INVARIANT FIELD THEORY MODELS WITH HIGHER INTEGRALS OF MOTION. 1: COMPLEX SCALAR FIELDS
B. S. Getmanov 1980 13 p refs
(JINR-E-2-80-319) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

All the Lagrange Lorentz invariant field theory models in two dimensional space time for the complex scalar fields with the quadratic in field gradients lagrangian which possess an infinite set of local conserved currents that are polynomial in field derivatives were found. All these models are integrable by the inverse scattering method. It is shown that only two nontrivial essentially different models of this type exist for massive fields (complex sine-Gordon-I and II"). DOE

N82-24971# Central Research Inst. for Physics, Budapest (Hungary).
N-BODY METHODS IN THE THEORY OF NUCLEAR REACTIONS
G. Bencze Aug. 1980 7 p refs Presented at the 9th European Symp. on Few Body Probl. in Nucl. and Particle Phys., Sesimora, Portugal, 3-6 Jun. 1980
(KFKI-1980-52; ISSN-0368-5330; ISBN-963-371-684-5) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

The traditional method of applying two body methods for the study of nuclear reactions is briefly reviewed. The recent developments in the N particle scattering theory are described in detail. The application of the methods in the study of effective two and few body problems is also considered. DOE

74 OPTICS

Includes light phenomena.

N82-24972 Royal Signals and Radar Establishment, Malvern (England).
ANOMALOUS REFLECTIVITY LOSSES OF COATED MIRRORS USED IN THE INFRARED
G. J. Ball Jan. 1982 22 p refs
(RSRE-MEMO-3360; BR82343) Copyright. Avail: Issuing Activity

Reflectivity losses of aluminum mirrors at nonnormal angles of incidence (theta) are shown to occur where theta, < the negative square root of (the complex refractive index squared + the extinction coefficient squared). Thin layers of Y203 and of Hf02 show losses for wavelengths > 12 micron. Carbon coating is abrasion resistant, chemically durable, and optically very efficient over a wide range of theta. Maximum reflectivity decreases by 0.7% between theta = zero and 60 deg.
Author (ESA)

N82-24973*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
HIGH SPEED MULTI FOCAL PLANE OPTICAL SYSTEM Patent Application
Peter O. Minott, inventor (to NASA) Filed 22 Dec. 1981 13 p
(NASA-Case-GSC-12683-1; US-Patent-Appl-SN-333535) Avail: NTIS HC A02/MF A01 CSCL 20F

An apparatus is disclosed for eliminating beam splitter generated optical aberrations in a pupil concentric optical system providing a number of spatially separated images on differential focal planes or surfaces. The system employs a buried surface beam splitter with spherically curved entrance and exit faces which are concentric to a system aperture stop. The entrance face is located in the path of a converging light beam directed to it from an image forming objective element which is also concentric to the aperture stop. NASA

N82-24974# Princeton Univ., N. J. Dept. of Chemical Engineering.
CHARACTERIZATION OF POLYMER-COATED OPTICAL FIBERS USING A TORSION PENDULUM Technical Report, Jan. 1980 - Jan. 1982
J. K. Gillham, L. T. Manzione (Bell Telephone Labs., Murray Hill, N.J.), U. C. Paek (Western Electric Co., Princeton, N.J.), and C. F. Tu (Bell Telephone Labs., Atlanta) Jan. 1982 21 p refs Submitted for publication
(Contract N00014-76-C-0200; NR Proj. 356-504)
(AD-A111150; TR-23) Avail: NTIS HC A02/MF A01 CSCL 11/3

A freely oscillating torsion pendulum has been used to characterize the dynamic mechanical behavior of single polymer-coated optical fibers. The dynamical mechanical spectra of the polymer coatings exhibit a glass transition temperature (Tg), a cryogenic glassy-state relaxation (T sub sec), and another cryogenic relaxation that is attributed to water present in the coating (T sub H2O). The shear modulus (G') of the coating was computed from the shear moduli of the composite specimens and the core, assuming that the coating and core deform through the same angle of oscillation. The glassy-state modulus was the same for both thin and thick coatings, although the intensity of the damping peaks, as measured by the logarithmic decrement, increased with coating thickness. Comparison of the dynamic mechanical behavior of a coated optical fiber and of a free film cast from the same reactive components shows that the polymer itself can absorb water at ambient conditions and display a mechanical relaxation at cryogenic temperatures. The T sub H2O and T sub sec relaxations are coupled with respect to their intensities. Latent chemical reactivity was found in one coating above its maximum temperature of cure. In this, the temperature of cure determines the glass transition temperature.
Author (GRA)

N82-24975# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
METHOD OF MANUFACTURING OPTICAL SURFACES OF REVOLUTION
V. V. Gorelik and S. I. Denisov 3 Feb. 1982 6 p Transl. into ENGLISH of Russian patent no. 315569, 1 Oct. 1971 p 1-2
(AD-A111409; FTD-ID(RS)T-1731-81) Avail: NTIS HC A02/MF A01 CSCL 13/8

A method of manufacturing optical surfaces of revolution, primarily of second order, by grinding and polishing the blank with a tubular tool with a scarf. In order to increase precision and productivity the blank is machined on an elliptical trajectory.
M.G.

N82-24976# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
OPTICAL MIRROR
S. I. Denisov and V. V. Nekrasov 29 Jan. 1982 5 p Transl. into ENGLISH of the Russian patent no. 288-255, 3 Dec. 1970 p 1-2
(AD-A110936; FTD-ID(RS)T-1531-81) Avail: NTIS HC A02/MF A01 CSCL 20/6

A mirror invented for the mechanical optics industry is described. The optical mirror has a foam-glass backing and a mirror coating. The objective of this invention is to reduce the weight of the mirror and eliminate deformation during manufacture. The method by which this is accomplished, by mounting a reinforcement in the backing and adding a polishable glue-filler layer between the backing and the mirror coating, is summarized.
M.D.K.

N82-24977# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
LASER TECHNIQUES IN CHEMICAL DIAGNOSTICS
Brigitte Attal 1981 58 p refs
(ONERA-NT-1981-8; ISSN-0078-3781) Avail: NTIS HC A04/MF A01

Optical diagnostic techniques that are applicable to fluid dynamics, combustion research and atmospheric sounding are reviewed. Development of these methods is outlined, stressing the use of lasers. Three of these techniques are discussed in detail: (1) laser induced fluorescence (LIF), (2) spontaneous Raman scattering (SRS), and (3) coherent antiStokes Raman scattering (CARS). The LIF method is found particulary well-suited for trace species analysis. Low scattering cross section is the major drawback of SRS, however, it is still preferred when the concentration of major constituents of a gas system is to be measured. The unique properties of CARS, i.e. good signal strength and absence of fluorescence interference, make this technique the best for nonintrusive flame diagnostics.
Author (ESA)

N82-24978# Societe Nationale Industrielle Aerospatiale, Toulouse (France). Direction Etudes.
TRANSMISSION BY FIBER OPTICS IN AERONAUTICS. NORMALIZATION AND FIBER OPTICS [TRANSMISSION PAR FIBRES OPTIQUES EN AERONAUTIQUE. NORMALISATION ET FIBRES OPTIQUES]
P. Desjean 7 Jan. 1982 43 p In FRENCH Presented at ADERA/AAAF Conf., St. Medard en Jalles, France, 5-6 Mar. 1981
(SNIAS-821-111-103) Avail: NTIS HC A03/MF A01

Transmission of a luminous signal (near infrared) along an optically transparent fiber is discussed and appropriate equipment is described. This includes structure of a fiber, light source and receiver, and various optical junctions and connectors. The compilation and application of norms for fiber optics technology is then considered and the state of affairs is reviewed. Recommendations are summarized.
Author (ESA)

N82-24979# European Space Agency, Paris (France).
RESULTS OF A SLANT RANGE VISIBILITY FIELD EXPERIMENT USING THE MODIFIED DFVLR MINI LIDAR
Christian Werner Feb. 1982 21 p refs Transl. into ENGLISH from "Ergebnisse einer Schraegsichtmesskampagne mit dem modifizierten DFVLR-Minilidar", Rept. DFVLR-Mitt-81-01 DFVLR, Oberpfaffenhofen, West Germany, 1981
(ESA-TT-731; DFVLR-Mitt-81-01) Avail: NTIS HC A02/MF A01; original report in GERMAN available at DFVLR, Cologne DM 5,60

Measured lidar visibility values were compared with: (1) in situ measurements from different heights above ground, using an instrumented tower; and (2) a slant installed transmissometer. The results show the possibilities of the lidar two point method for practical application.
Author (ESA)

N82-24930# National Bureau of Standards, Washington, D.C.
MEASUREMENT OF OPTICAL FIBER BANDWIDTH IN THE FREQUENCY DOMAIN
G. W. Day Sep. 1981 48 p refs Sponsored in part by DOD and Army
(PB82-135179; NBS-TN-1046) Avail: NTIS HC A03/MF A01 CSCL 20F

The design, evaluation and performance of a system for determining the magnitude of the transfer function(hence, bandwidth) of a multimode optical fiber are presented. The system operates to about 1450 MHz using a tracking generator/spectrum analyzer combination for narrowband detection. It is constructed, almost entirely, from commercially available components. The system is less complex and easier to use than an equivalent time domain system and the measurement precision is comparable. Background information on time and frequency domain specifications, fiber bandwidth limitations, and alternate frequency domain techniques is also presented.
GRA

N82-24260# Joint Publications Research Service, Arlington, Va.
OPERATING PRINCIPLES OF OPTICO-ELECTRONIC INSTRUMENTS
V. Fedorov *In its* USSR Rept.: Space, No. 15 (JPRS-80424) 29 Mar. 1982 p 59-61 Transl. into ENGLISH from Aviats. Kosmonavt. (USSR), no. 11, Nov. 1981 p 22-23 (For primary document see N82-24253 15-12)
Avail: NTIS HC A07/MF A01

N82-25100*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
A STATISTICAL MODEL OF THE PHOTOMULTIPLIER GAIN PROCESS WITH APPLICATIONS TO OPTICAL PULSE DETECTION
H. H. Tan *In its* The Telecommun. and Data Acquisition Rept. 15 Apr. 1982 p 55-67 refs (For primary document see N82-25092 15-99)
Avail: NTIS HC A09/MF A01 CSCL 20F

N82-25102*# University of Southern California, Los Angeles.
ERROR PROBABILITIES IN OPTICAL PPM RECEIVERS WITH GAUSSIAN MIXTURE DENSITIES
R. M. Gagliardi *In* JPL The Telecommun. and Data Acquisition Rept. 15 Apr. 1982 p 72-77 refs (For primary document see N82-25092 15-99)
Avail: NTIS HC A09/MF A01 CSCL 20F

75 PLASMA PHYSICS

Includes magnetohydrodynamics and plasma fusion.
For ionospheric plasmas see *46 Geophysics*. For space plasmas see *90 Astrophysics*.

N82-24981# Stanford Univ., Calif. Dept. of Mechanical Engineering.
AXIAL FIELD LIMITATIONS IN MHD GENERATORS. PART 2: ANALYTICAL INVESTIGATION AND COMPARISON WITH EXPERIMENTS
William Unkel and Charles H. Kruger Jan. 1981 32 p refs Backup document for AIAA Synoptic. 'Analytical Investigation of Axial Field Limitations in MHD Generators", scheduled for publication in Journal of Energy in Jan. - Feb. 1983
(LOG-E763) Avail: NTIS HC A03/MF A01

A detailed fluid and electrical model was developed and used to predict the prebreakdown and incipient breakdown characteristics for a simplified configuration. The model shows that an electro-thermal instability, in either the plasma or the interelectrode insulator, was responsible for the breakdown; the predicted values of the threshold voltage, below which breakdown would not occur, were comparable to the experimental values. Detailed comparison of theory and experiment, however, indicates only moderately good agreement, even for the relatively sophisticated model used. Nevertheless, the model can be used to predict the trends of threshold voltage with the channel parameters. Breakdown modeling of the full generator configuration was limited to a coarse electrical solution to simulate the effect of single or multiple breakdowns on the behavior of the surrounding gaps; moderate success was achieved with the model. Author

N82-24982# Nagoya Univ. (Japan).
WORKSHOP ON FIRST WALL COATING
K. Kamada and M. Fukutomi (National Research Inst. for Metals) Mar. 1982 230 p refs Workshop held at Nagoya, Japan, 28-29 Nov. 1980
(IPPJ-551) Avail: NTIS HC A11/MF A01

Impurity control and first wall design in the JT 60 long pulse Tokamak is discussed. The present state of coating technology in Japan is reviewed with emphasis on fabrication methods and the characterization of thin coated films available by plasma spraying and chemical and physical vapor deposition. Surface preparation, radiation damage, internal stress, crystal structure and bonding are considered as well as the application of silicon carbide, titanium nitride, titanium carbide, titanium boride, and chromium nitride coatings by magnetron sputtering, long plating, electron beam evaporation, and gas absorption and reactive r.f. sputtering. A.R.H.

N82-24983# Universidad Politecnica de Madrid (Spain). Escuela Tecnica Superior de Ingenieros Aeronauticos.
TRANSITION FROM ISENTROPIC TO ISOTHERMAL EXPANSION IN LASER PRODUCED PLASMAS
A. Barrero 1980 18 p refs
(JEN-474) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

The transition experienced by the expansion flow of laser produced plasmas when one moves from long, low intensity pulses to short, intense ones was studied. For planar geometry and large ion number Zsub(i) the transition occurs for dphi/dt approxmately equal to 0.14 (27/8)Ksup(7/2) Zsub(i)sup(3/2)nsub (c)sup(2)/msub(i)sup(3/2)Ktilde; phi,k,nsub(c),msub(i) and Ktilde; are laser intensity, Boltzmann's constant, ion mass, and Spitzer's heat conduction coefficient. This result remains valid for finite Zsub(i), though the numerical factor in dphi-dt is different. A similar transition occurs in spherical geometry even in steady conditions. Shorter wavelength lasers and higher Zsub(i) plasmas allow faster rising pulses below transition. Author (DOE)

N82-24984# Central Research Inst. for Physics, Budapest (Hungary).
PLASMA DIAGNOSTICS WITH LASERS
J. S. Bakos Nov. 1980 17 p refs
(KFKI-1980-119) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

A laser plasma diagnostic setup is described. Measurements by scattering laser light on free and bound electrons as well as on plasma modes of the electron density, the electron and ion temperatures and their distributions are outlined. Different types of interferometers used for the measurement of the refraction index of the plasma are described. The Faraday rotation measurements capable of determining the current density and the local magnetic field are mentioned. DOE

N82-24985# Japan Atomic Energy Research Inst., Tokyo. Div. of Thermonuclear Fusion Research.
BALLOONING INSTABILITY IN A TOKAMAK WITH ANISOTROPIC ION TEMPERATURE
K. Itoh, Sanae Inoue (Hiroshima Univ., Japan), and Takashi Tuda Sep. 1980 10 p refs In JAPANESE; ENGLISH summary
(JAERI-M-9067) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

The stability of high-mode-number ballooning modes in a Tokamak plasma with anisotropic ion pressure is investigated, taking into account the finite ion gyroradius effect. The stability condition is derived for the case of isotropic pressure. DOE

N82-24986# Max-Planck-Gessellschaft, Garching (West Germany).
MODEL CALCULATIONS OF THE TEARING INSTABILITY ASSOCIATED WITH AC MODULATION OF THE PLASMA-CURRENT IN TOKAMAKS
F. Pohl, W. Engelhardt, K. Lackner, M. Murmann, and S. vonGoeler Jun. 1980 62 p refs
(IPP-6/198; IPP-3/60) Avail: NTIS (US Sales Only) HC A04/MF A01; DOE Depository Libraries

The tearing mode stability of the radial profiles of current density resulting from the skin effect accompanying AC modulation is calculated using a computer program. An AC component was superposed on the plasma current and a computer program was designed to calculate the current distribution accompanying the AC modulation which takes into account the skin effect. It is shown that the AC modulation of high amplitude impairs plasma stability and can lead to disruption. Calculations on the stability of the models were also performed. The following topics are presented: description of the computer program; skin effects; stability of the tearing modes, and the heating effects associated with AC modulation. DOE

N82-24987# Technische Hogeschool, Delft (Netherlands).
LINEAR WAVES IN A WARM MAGNETOPLASMA. A STUDY IN HOMOGENEOUS AND INHOMOGENEOUS WAVE PROPAGATION Ph.D. Thesis
Hubertus Wilhelmus Antonius Maria Rompa 19 Dec. 1980 87 p refs In ENGLISH and DUTCH
(INIS-mf-6409) Avail: NTIS (US Sales Only) HC A05/MF A01; DOE Depository Libraries

Using kinetic theory the derivation of the dispersion relation that describes electrostatic waves in a warm, collisionless plasma is presented. The relation is derived in a Cartesian geometry and for a fully ionized two component plasma. The plasma is current driven and is subject to a uniform external magnetic field, while a density gradient and an electric field perpendicular to the magnetic field are admitted. If the equilibrium distribution function is taken to be a shifted Maxwellian distribution, it is possible to show that the equilibrium situation is characterized by: an exponential density profile, constant drift velocity in the direction of the magnetic field, and constant diamagnetic and E X E drift velocities perpendicular to the magnetic field. Considering small perturbations of this equilibrium, the dispersion relation may be derived with the aid of a double Fourier transformation. Special attention is paid to the parameter regime of the hollow cathode discharge and, it is determined to what extent the derived dispersion relation permits the instabilities that were found experimentally. Finally, a method is treated to compute numerically a certain type of integral that plays an important role in the kinetic theory of plasma waves. DOE

N82-24988# International Atomic Energy Agency, Vienna (Austria). International Nuclear Data Committee.
CHARGE EXCHANGE OF HYDROGEN ATOMS WITH MULTIPLY CHARGED IONS IN A HOT PLASMA
V. A. Abramov, F. F. Baryshnikov, and V. S. Lisitsa Aug. 1980 19 p refs

(INDC(CCP)-153/GA; IAE-3121) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

The symmetry properties of the hydrogen atom were used to calculate the charge exchange cross sections sigma of hydrogen with the nuclei of multiply charged ions, while allowance was made for the degeneration of final states. If the transitions between these states produced by rotation of the internuclear axis are taken into account, there is a qualitative change in the dependence of sigma on v for low values of v (a gradual decrease in the cross section instead of the exponential one in the Landau-Zener model) and also a considerable increase in the peak cross section. The cross sections are calculated for a wide range of velocities and charge values-Z. The distribution of final states over orbital angular momenta is found. DOE

N82-24989# Amsterdam Univ. (Netherlands).
CENTRIFUGAL EFFECTS IN A WEAKLY IONIZED ROTATING GAS Ph.D. Thesis
M. M. B. Wijnakker 1980 115 p refs In DUTCH and ENGLISH
(INIS-MF-6327) Avail: NTIS (US Sales Only) HC A06/MF A01; DOE Depository Libraries

A weakly ionized gas rotating under the influence of the Lorentz force in a cylindrical vessel is discussed. This force occurs if an electrical current flows across a magnetic field. The investigation concerns the possibility of bringing a neutral gas into rotation by a relatively small number of charged particles (ions and electrons) on which the Lorentz force is acting. The possibility to using the centrifugal force, due to the rotation of the gas, for mass separation, is also discussed. DOE

N82-24990# Fom-Instituut voor Plasmafysica, Rijnhuizen (Netherlands).
THE BELT-SHAPED SCREW-PINCH REACTOR
M. Bustraan (ENC, Petten, Netherlands), B. Brandt, G. C. Damstra (KEMA, Arnhem, Netherlands), J. A. Hoekzema, H. T. Klippel (ECN, Petten, Netherlands), K. Lievense (Neratoom, The Hague), W. Schuurman, H. J. Veringa (ECN, Petten, Netherlands), and K. A. Verschuur (ECN, Petten, Netherlands) Dec. 1981 70 p refs Sponsored by Euratom and Nederlandse Organisatie voor Zuiver-Wetenschappelijk Onderzoek (ZWO)
(Rept-81-139; ECN-110) Avail: NTIS HC A04/MF A01

Economic and technical aspects of a BSPRIL are considered. Force-free currents in a low density outer plasma envelope enable beta to rise to values on the order of 50%. Reactor operation consists of the formation, heating and ignition of a very small amount of the fuel to be burnt in one pulse by the fields generated by normal or superconducting coils. Then follows injection of the greater part of the fuel by DT pellets and consequent plasma heating and expansion by nuclear reactions without undue disturbing of the plasma current configuration. Technical requirements include an insulating first wall and fast rising magnetic fields produced by superconducting coils. A BSPRIL with pulsed superconducting coils is an economically attrative alternative to other toroidal pinch reactors and Tokamaks.. A BSPRIL with normal conducting copper coils is not much more expensive than reactors with stationary superconducting coils. Author (ESA)

N82-24991# Royal Inst. of Tech., Stockholm (Sweden). Dept. of Plasma Physics.
VERY STRONG DOUBLE LAYERS IN A MAGNETIZED PLASMA COLUMN
Staffan Torven Dec. 1981 18 p refs
(TRITA-EPP-81-05; ISSN-0348-7539) Avail: NTIS HC A02/MF A01

Observations of double layers with potential drops up to 1000 V are reported. The experiments were done in a triple plasma device where a magnetized plasma column is maintained in the central chamber by two plasma sources. Axial potential profiles are presented as well as probe measurements, showing the existence of an energetic electron beam on the high potential side of the layer. Experimental evidence of the validity of the Langmuir condition is given. The double layers are stable for a wide range of parameter values, but instabilities leading to large amplitude fluctuations can be introduced. Author (ESA)

N82-24901# Essen Univ. (West Germany). Fachbereic Physik.
MEMORY EFFECTS AND CLEANING OF PLASMA TUBES
H. G. Lergon and K. G. Mueller *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 123-128 refs Sponsored by Ministerium fuer Wissenschaft und Forschung des Landes Nordrhein-Westfalen (For primary document see N82-24880 15-70)
Avail: NTIS HC A16/MF A01

N82-24914# International Atomic Energy Agency, Vienna (Austria). Nuclear Data Section.
COLLISION DATA FOR DIAGNOSTICS OF MAGNETICALLY CONFINED PLASMAS
Konstantinos Katsonis *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 205-215 refs (For primary document see N82-24880 15-70)
Avail: NTIS HC A16/MF A01

N82-24928# Trento Univ., Povo (Italy). Inst. per la Ricerca Scientifica e Technologica.
THE ENERGY DEPENDENCES OF REACTIONS OF C+, CH+ AND CH2+ WITH VARIOUS NEUTRALS
St. Niccolini, D. Bassi, S. Iannotta, H. Villinger, R. Richter, A. Saxer, and W. Lindinger *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 291-294 refs Prepared in cooperation with Innsbruck Univ. (For primary document see N82-24880 15-70)
Avail: NTIS HC A16/MF A01

76 SOLID-STATE PHYSICS

Includes superconductivity.

For related information, see also *33 Electronics and Electrical Engineering* and *36 Lasers and Masers*.

N82-24992*# Honeywell Electro-Optics Center, Lexington, Mass.
DEFECT CHEMISTRY AND CHARACTERIZATION OF Hg SUB 1x Cd SUB x Te Final Report, 18 Dec. 1978 - 17 Feb. 1982
H. R. Vydyanath Feb. 1982 7 p refs
(Contract NAS8-33245)
(NASA-CR-162005; NAS 1.26:162005; HONEYWELL-8203-1)
Avail: NTIS HC A02/MF A01 CSCL 20L

Single crystal samples of undoped and doped Hg sub 1-x Cd sub x Te were annealed at varying temperatures and partial pressures of Hg. Hall effect and mobility measurements were carried out on these samples after quenching to room temperature. Based on the variation of the carrier concentration and the carrier mobility as a function of the partial pressure of Hg temperature, and dopant concentration, defect models were established for the doped and the undoped crystals. These models indicate that the native acceptor defects in both Hg0.8Cd0.2Te and Hg0.6Cd0.4Te doubly ionized and the native donor defects are negligible in concentration, implying that p to n conversion in these alloys occurs due only to residual donors. Incorporation mechanism of copper, indium, iodine, and phosphorus were investigated. A large concentration of indium is found to be paired with the native acceptor defects. Results on crystals doped with phosphorus indicate that phosphorus behaves amphoterically, acting as a donor on Hg lattice sites and as an acceptor intersitially on Te lattice sites. A majority of the phosphorus is found to be present as neutral species formed from the pairing reaction between phosphorus on Hg lattice sites and phosphorus in interstitial sites. Equilibrium constants for the intrinsic excitation reaction, as well as for the incorporation of the different dopants and the native acceptor defects were established. B.W.

N82-24993*# National Aeronautics and Space Administration. Pasadena Office, Calif.
A METHOD OF INCREASING MINORITY CARRIER LIFETIME IN SILICON WEB OR THE LIKE Patent Application
James K. Liu (JPL, California Inst. of Technology, Pasadena), Guenter H. Schwuttke (JPL, California Inst. of Technology, Pasadena), and Krishna M. Koliwad, inventors (to NASA) (JPL,

California Inst. of Technology, Pasadena) Filed 31 Mar. 1982 10 p
(Contract NAS7-100)
(NASA-Case-NPO-15530-1; US-Patent-Appl-SN-364092) Avail: NTIS HC A02/MF A01 CSCL 20B

A silicon dendrite is grown as a ribbon forming two silicon layers which are separated by an interface layer which contains a certain large number of defects. Significant increase of minority carrier lifetime with homogeneous distribution at the outer surfaces of the two silicon crystal layers are achieved by processing the web in an atmosphere of a selected gas, e.g., oxygen, nitrogen, or an inert gas, for about 30 minutes to several hours, at a temperature preferably on the order of 900 to 1200 C. NASA

N82-24994# Naval Research Lab., Washington, D. C.
LOW-LEVEL SELF-CONTAINED LIGHT SOURCES Final Report
D. J. Bogan and H. W. Carhart 24 Feb. 1982 16 p refs
(SF4340039)
(AD-A111626; NRL-MR-4729) Avail: NTIS HC A02/MF A01 CSCL 13/1

This report is a brief survey of the methods available for production of low-level continuous light by simple, trouble-free self-contained devices. Some order of magnitude calculations of efficiency are presented with a brief discussion of the practical advantages and disadvantages of several light generating schemes. The most promising of these schemes are solid-state devices. Author (GRA)

N82-24995# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
PHOTOLUMINESCENCE STUDY OF ION IMPLANTATION DAMAGE IN GALLIUM ARSENIDE M.S. Thesis
Manuel V. Key Dec. 1981 84 p refs
(AD-A111135; AFIT/GEO/PH/81-2) Avail: NTIS HC A05/MF A01 CSCL 20/2

The 5 deg photoluminescence (PL) from 1.55 eV to 1.36 eV of semi-insulating bulk GaAs implanted with Si was observed, using the 488 nm line of an argon-ion laser. Implant dosages were 10 to the 12th power, 10 to the 13th power, 10 to the 14th power, and 10 to the 15th power ions/sq cm. Separate sets of samples were annealed at 750 C and 900 C. The virgin unannealed sample spectrum contained a shallow donor peak at 1.513 eV, a carbon donor-to-carbon acceptor peak at 1.490 eV, a possible carbon donor-to-zinc acceptor peak at 1.487 eV, and an optical phonon peak at 1.454 eV. The virgin annealed sample spectra included, additionally, a vacancy complex-to-silicon acceptor peak at 1.406 eV, a Ga vacancy complex peak at 1.358 eV and a phonon replica at 1.322 eV. The spectra of the implanted unannealed samples showed an increasing quenching of native peaks with increasing dosage, and included no new damage related peaks. The spectra of the implanted samples showed an increase in the native peaks due to annealing but not due to Si dosage increases. The increase in Si dosage caused an increase in low energy broad peaks. A temperature study (5 to 77 K), and chemical etching depth resolved study of a sample implanted with 10 to the 15th power ions sq cm and annealed at 900 C showed two broads peaks: one near 1.38 eV and one near 1.42 eV. Author (GRA)

N82-24996# Lincoln Lab., Mass. Inst. of Tech., Lexington.
InP MATERIALS Annual Technical Summary Report, 1 Oct. 1980 - 30 Sep. 1981
Gerald W. Iseler 30 Sep. 1981 28 p refs
(Contract F19628-80-C-0002)
(AD-A110508; ESD-TR-81-301) Avail: NTIS HC A03/MF A01 CSCL 20/2

The improvement of the yield of high purity polycrystalline InP as source material for crystal growth and the optimization of the liquid encapsulated Czochralski (LEC) method to grow crystals with low dislocation density and uniform dopant concentration was undertaken. Reproducible twin free growth in the lower gradient by modifying the pulling rod and its rotation mechanism to reduce system vibration was obtained. An X-ray topography and CO2 laser transmission show that doped LEC crystals contain prominant growth striations, probably produced by random convection currents in the melt, that are associated with abrupt changes in dopant concentration. Infrared transmission at 10.6 microns was measured on p-type InP samples to determine the free carrier absorption due to holes. It is found that the absorption cross section is much higher for holes than for electrons. E.A.K.

N82-24997*# Lincoln Lab., Mass. Inst. of Tech., Lexington.
SOLID STATE RESEARCH, 1981:2 Quarterly Technical Summary Report, 1 Feb. - 30 Apr. 1981
Alan L. McWhorter 15 May 1981 85 p refs Sponsored in part by NASA, Army, DARPA, Navy and DOE
(Contract F19628-80-C-0002; AF Proj. 649L)
(NASA-CR-168893; NAS 1.26:168893; AD-A110947; ESD-TR-81-95) Avail: NTIS HC A05/MF A01 CSCL 09/3

This report covers in detail the solid state research work of the Solid State Division at Lincoln Laboratory for the period 1 February through 30 April 1981. The topics covered are Solid State Device Research, Quantum Electronics, Materials Research, Microelectronics, and Analog Device Technology. GRA

N82-24998# Gosudarstvennyi Komitet po Ispolzovaniyu Atomnoi Energii, Moscow (USSR). Inst. Teoreticheskoj i Ehksperimental'noj Fiziki.
ZEEMAN EFFECT: NEW OUTLOOK ON OLD PERTURBATION THEORY
A. V. Turbiner 1980 8 p refs
(ITEP-99(1980)) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

The problem of hydrogen atom placed in constant external magnetic field is studied. The properties of ordinary perturbation theory in the framework of a new approach are investigated. The ground states and the excited states are discussed. It is shown that the wave function corrections within this approach are simpler than within ordinary one and contain a finite number of harmonics with polynomial coefficients. Some coefficients of these polynomials are found explicitly. DOE

N82-24999# Central Research Inst. for Physics, Budapest (Hungary).
THE SCALES OF EUCLIDIAN AND HAMILTONIAN LATTICE QCD
A. Hasenfratz and P. Hasenfratz Feb. 1981 12 p refs
(KFKI-1981-15) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

The relation between the scales of Euclidean lattice QCD and those of the continuum formulation (in the mementum-subtraction schema) is confirmed by recalculating their ratio by using the background field method. The relation between the scales of Hamiltonian and Euclidean SU(N) lattice gauge theories is also determined. It strongly differs from the numbers previously used in the literature. It is recommended that the strong coupling expansions for the string tension is reanalyzed. DOE

N82-25000# Central Research Inst. for Physics, Budapest (Hungary).
SPIN REORIENTATION TRANSITIONS IN CO2(+) SUBSTITUTED ErFeO3
E. Svab, A. M. Kadomtseva, I. B. Krinjecki, M. M. Lukina, and V. M. Matvejev Dec. 1980 10 p refs
(KFKI-1980-127) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

The magnetic phase diagram for the Co2(+) substituted ErFeO3 in the concentration range up to 5 at% was obtained from magnetic and neutron diffraction measurements. Neutron diffraction measurements were performed on the powder samples in the temperature range of 80-700 K at the WWRS-M reactor using a monochromated neutron beam of 1.14 A wavelength. From the low temperature magnetostriction measurements the temperature dependence of the threshold field along the a axis induced by the spin reorientation G sub (yz) (FEMALE) G sub (z) F sub (x) was measured and an estimated for anisotropy energy of the iron sublattice in the (bc) plane, resulting in K sub (bc) sup (Fe) = 0.2 K. The calculations for the magnetic anisotropy originating from the Co2(+) ions give K sub (bc) sup (Co) = 0.2 K, which is considerably less than the anisotropy constant in the (ac) plane: K sub (ac) sup (Co) = -120 K. DOE

N82-25001# Central Research Inst. for Physics, Budapest (Hungary).
POSITRON ANNIHILATION AND MOESSBAUER EFFECT STUDIES OF In-Pb AND Cu-Ni BINARY ALLOYS
Khalid Al Ani, I. Dezsi, A. Balogh, Zs. Kajcsos, and D. L. Nagy Jan. 1981 23 p refs
(KFKI-1981-02; ISBN-963-371-778-7; ISSN-0368-5330) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

The alloy systems In(1-x)Pb(x) with x = 0.00, 0.05, 0.20, 0.50, 0.80, 1.00 and Cu(1-x)Ni(x) with x = 0.00, 0.10, 0.15, 0.17, 0.25, 0.30, 0.40, 0.60, 0.80 and 1.00 were studied using the positron annihilation method. Moessbauer spectroscopy was used for the In-Pb system studies. The composition dependence of the h parameter obtained from the angular distribution curves indicates a preferred annihilation of positron at the Pb atomic site in In-Pb alloys and at the Ni atomic site in Cu-Ni alloys. Additionally, temperature dependent measurements were carried out on In-20% Pb in order to evaluate the vacancy formation energy. The obtained value was 0.48 + or - 0.03 eV. The low momentum component (attributed to the contribution of the conduction electrons in the annihilation process) observed from the momentum distribution was correlated with the isomer shift obtained from the Moessbauer effect studies. DOE

N82-25002# Copenhagen Univ. (Denmark). Physics Lab. 2.
SPUTTERING YIELD MEASUREMENTS ON SINGLE CRYSTAL COBALT
V. S. Chernysh (Moscow State Univ.), A. Johansen, and L. Sarholt-Kristensen 1981 20 p refs Sponsored in part by Danish Natural Science Research Council
(KU-HCOE-FL2-R-81-02; ISSN-0106-7222) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

Single crystals of cobalt were bombarded with 80 keV A (+) ions in the <0001> direction of the hcp structure and in the <111> direction of the fcc structure. The sputtering yields, measured by the weight loss method, depend on the crystal structure, and damage, introduced by the ion bombardment, is shown to play a significant role in the explanation of the measured sputtering yields. S.L.

N82-25003# Copenhagen Univ. (Denmark). Physics Lab. 2.
SPUTTERING YIELD MEASUREMENTS ON hcp AND fcc COBALT
V. S. Chernysh, A. Johansen, and L. Sarholt-Kristensen 1980 6 p refs Sponsored by Danish Natural Science Research Council.
(KU-HCOE-FL2-R-80-12) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

Single crystals of cobalt with the <0001> axis normal to the surface were used. When heated above the transition temperature, the <0001> axis transforms to a <111> axis in the fcc structure. Both the total sputtering yield and the angular distribution in yield were investigated. The experimental results show a pronounced reduction in sputtering yield of the fcc structure compared to the hcp structure. DOE

N82-25004# Central Research Inst. for Physics, Budapest (Hungary).
MULTIPLE SPIN ECHOES IN NONMAGNETIC AMORPHOUS ALLOYS
K. Tompa, I. Bakonyi, and P. Banki Oct. 1980 6 p refs
(KFKI-1980-97) Avail: NTIS (US Sales Only) HC A01/MF A01; DOE Depository Libraries

Two of the selective averaging methods in spin space, namely the two pulse Carr-Purcell and the Carr-Purcell-Meiboom-Gill methods were applied in the (31)P NMR spectroscopy of Ni78P22, (Ni27Cu73) 82P18 and Ni80P14B6 amorphous alloys. The second moment among (31)P spins was directly determined. DOE

N82-25005# Central Research Inst. for Physics, Budapest (Hungary).
MOESSBAUER STUDY OF AMORPHOUS Fe-P ALLOYS
L. Takacs and E. Toth-Kadar Oct. 1980 6 p refs
(KFKI-1980-96) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

Preliminary Mossbauer results on electrodeposited Fe-P amorphous alloys are presented. Very broad hyperfine field distributions and relatively large isomer shifts were found. DOE

N82-25006# Paris XI Univ., Orsay (France). Inst. de Physique Nucleaire.
EVIDENCE FOR ORDERED METAL HYDRIDE PRODUCTION BY LOW TEMPERATURE ION IMPLANTATION
H. Bernas, A. Traverse, L. Brossard, J. Chaumont, F. Lalu, and L. Dumoulin 1980 16 p refs
(IPNO-PhN-80-24) Avail: NTIS (US Sales only) HC A02/MF A01; DOE Depository Libraries

Metallic films of palladium and nickel was studied by residual resistivity measurements versus implanted dose, up to H concentrations approximately 120 to 130%. Proton ordering in octahedral interstitial sites is evidenced even if the targets are previously disordered. In contrast to the low hydrogen concentration range, where Matthiessen's rule seems to be valid, the resistive contributions of hydrogen and implantation induced disorder were not found to add independently at high implanted proton dose. DOE

N82-25007# Max-Planck-Institut fuer Stroemungsforschung, Goettingen (West Germany).
RAINBOW SCATTERING OF LOW ENERGY Li IONS ON W SINGLE CRYSTAL SURFACES, WITH SPECIAL REGARD TO THE AZIMUTHAL DEPENDENCE Thesis [REGENBOGENSTREUUNG NIEDERENERGETISCHER Li+ -IONEN AN W-EINKRISTALLOBERFLAECHEN UNTER BESONDERER BERUECKSICHTIGUNG DER AZIMUTABHAENGIGKEIT]
Klaus-Ruediger Mann Jun. 1981 118 p refs In GERMAN
(MPIS-10/1981; ISSN-0436-1199) Avail: NTIS HC A06/MF A01; Fachinformationszentrum, Karlsruhe, West Germany DM 22,20

In-plane angular distributions and energy loss spectra were taken with the time of flight method. (Angular distributions were also taken during cooling of the crystal after heating up to about 2000 K.) The dependence of the scattering on the azimuthal orientation of the surfaces was studied. A strongly pronounced rainbow structure with minimum two maxima appears in the angular distributions for incidence angles between 10 and 70 deg. Energy loss spectra have no significant azimuthal dependence, contrary to angular distributions. The azimuthal dependence is explained by the crystal surface anisotropy. Trajectory calculations were conducted for quantitative comparison of theory and experiment. Author (ESA)

N82-25008# Technische Hogeschool, Delft (Netherlands). Vakgroep.
DRAFT TUBE BAFFLE (DTB) CRYSTALLIZERS: A STUDY OF STATIONARY AND DYNAMICALLY BEHAVING CRYSTAL SIZE DISTRIBUTIONS (CSD)
B. G. M. deLeer Nov. 1981 232 p refs
(WTHD-142) Avail: NTIS HC A11/MF A01

Based on population balance, CSD behavior as a function of geometrical and operating variables was studied, using a crystallizer. A potash alum-water system, involving a separation technique which uses surface active agents and an apolar, organic liquid to separate potash alum crystals from mother liquid under the influence of gravity was used to check experimental findings against literature data. Results show action of annular settling spaces is strongly influenced by fluid velocities perpendicular to those directed upwards. The well-mixed volume decreases with increasing crystallizer size until a minimum effective volume is reached. As supersaturation is constant throughout the crystallizer volume under stationary operating conditions, the annular settling space behaves like a growth chamber for crystals in its volume. Swirl in the lower part of the annular volume introduces significant back mixing. Crystals within this space either grow and return to the well-mixed part, or withdraw from the annular volume permanently. Author (ESA)

N82-25009# Florida Univ., Gainesville. Dept. of Electrical Engineering.
CONDUCTIVITY MOBILITY, HALL MOBILITY, AND RESISTIVITY IN RHO-TYPE SILICON Final Report, 11 Mar. 1977 - 10 Jun. 1980
Sheng S. Li Sep. 1981 9 p refs
(Contract N8-79-SBCA-0168; ARPA Order 2397)

(PB82-135864; NBS-GCR-81-334) Avail: NTIS HC A02/MF A01 CSCL 20L

Detailed theoretical and experimental studies of the dopant density, hole density, hole mobility, and resistivity in p-type silicon were carried out over a wide range of dopant density (10 to the 14th power to 3 x 10 to the 18th power/cc) and temperature (100 to 400 K). Good agreement between theory and experiment was obtained, and the theoretical models appear to be adequate for interpreting the temperature and dopant density dependence of resistivity of boron-, gallium-, and indium-doped silicon over the ranges studied. GRA

N82-24894# IBM Watson Research Center, Yorktown Heights, N.Y.

TOWARDS A UNIFIED MODEL FOR THE FORMATION OF SPUTTERED EXCITED STATES

Roger Kelly *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 84-90 refs (For primary document see N82-24880 15-70)
Avail: NTIS HC A16/MF A01

N82-24895# Technische Univ., Vienna (Austria). Inst. fuer Allgemeine Physik.

ION NEUTRALIZATION AT SURFACES

P. Varga *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 91-94 refs (For primary document see N82-24880 15-70)
Avail: NTIS HC A16/MF A01

N82-24897# Max-Planck-Institut fuer Plasmaphysik, Garching (West Germany).

ION SURFACE INTERACTIONS AT LOW ENERGIES

E. Taglauer *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 107-105 refs (For primary document see N82-24880 15-70)
Avail: NTIS HC A16/MF A01

N82-24898# Technische Univ. Munich, Garching (West Germany). Inst. fuer Festkoerperphysik.

PHOTON SIMULATED DESORPTION REVISITED

D. Menzel *In* Innsbruck Univ. Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 106-110 refs (For primary document see N82-24880 15-70)
Avail: NTIS HC A16/MF A01

N82-24929# Innsbruck Univ. (Austria). Inst. fuer Experimentalphysik.

A SELECTED ION FLOW TUBE INVESTIGATION ON THE QUENCHING OF N2 (V NOT EQUAL TO 0) BY VARIOUS NEUTRALS

W. Dobler, F. Howorka, and W. Lindinger *In its* Symp. on Atomic and Surface Phys., 1982 Contrib. 1982 p 295-298 refs Sponsored by Oesterreichischer Fonds zur Foerderung der Wissenschaftlichen Forschung (For primary document see N82-24880 15-70)
Avail: NTIS HC A16/MF A01

77 THERMODYNAMICS AND STATISTICAL PHYSICS

Includes quantum mechanics; and Bose and Fermi statistics.

For related information see also *25 Inorganic and Physical Chemistry* and *34 Fluid Mechanics and Heat Transfer.*

N82-25010# Central Research Inst. for Physics, Budapest (Hungary).

QUANTIZATION OF SPACETIME

M. Banai Jan. 1981 19 p refs Presented at the 4th Conf. on Quantum Theory and Structures of Time and Space, Tutzing, West Germany, 7-14 Jul. 1980 Sponsored in part by Loyola Univ., New Orleans
(KFKI-1981-01; ISSN-0368-5330; ISBN-963-371-777-9) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

A program of quantization of relativistic local field theories in terms of Hilbert modules over noncommutative C(*)-algebras is outlined. The spacetime of the considered systems should become a quantum represented by a Hilbert space. Two suggestions are given for the possible determination of this quantum spacetime. DOE

N82-25011# Central Research Inst. for Physics, Budapest (Hungary).

RENORMALIZATION GROUP STUDY OF THE ONE DIMENSIONAL QUANTUM POTTS MODEL

J. Solyom and P. Pfeuty (Paris-Sud Univ.) Jan. 1981 38 p refs Prepared in cooperation with Illinois Univ. at Urbana-Champaign
(KFKI-1981-04; ISBN-963-371-780-9; ISSN-0368-5330) Avail: NTIS (US Sales Only) HC A03/MF A01; DOE Depository Libraries

The phase transition of the classical two dimensional Potts model, in particular the order of the transition as the number of components-q increases, was studied by constructing renormalization group transformations on the equivalent one dimensional quantum problem. It is shown that the block transformation with two sites per cell indicates the existence of a critical q/sub c/ separating the small-q and large-q regions with different critical behaviors. The physically accessible fixed point for q > q/sub c/ is a discontinuity fixed point where the specific heat exponent (-) = 1 and therefore the transition is of first order. DOE

N82-25012# Joint Inst. for Nuclear Research, Dubna (USSR).

CLASSICAL AND QUANTUM SCATTERING CROSS-SECTIONS ON THE IMPENETRABLE SPHERE

G. N. Afanasiev, M. B. Dobromyslov, and V. P. Schpakov 1980 7 p refs
(JINR-E-2-13044) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

The problem of the difference of particle scattering cross sections on the impenetrable sphere is considered in the frame of quantum mechanics and classical mechanics. Using plane waves for the incident particles and the solutions of the Schroedinger equation with the definite energy and momenta for the wave functions quantum and classical cross sections are compared. It is shown that these cross sections are the same if the incident flow is defined similarly in both cases. DOE

N82-25013# Joint Inst. for Nuclear Research, Dubna (USSR). Lab. of Theoretical Physics.

NOTE ON THE PROBLEM OF TWO INTERACTING STOCHASTIC PARTICLES

Kh. Namsrai 1980 8 p refs
(JINR-E-2-80-56) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

Within the framework of the Kershaw approach and of a hypothesis on the space stochasticity, the problem of two interacting particles is investigated. It is shown that equations of motion for two stochastic particles interacting through a potential U(x1 vector - x2 vector) are separated into two parts. One of them describes the center of masses motion and the other their relative motion. Some nonlinear equations of motion for two stochastic particles are obtained which formally coincide with the Schroedinger equations. DOE

N82-25014# Technische Hogeschool, Delft (Netherlands). Lab. for Aero- and Hydrodynamics.

NONLOCAL CONTINUUM THEORY: A HIERARCHY OF BALANCE EQUATIONS

G. D. C. Kuiken Aug. 1981 28 p refs
(WTHD-138) Avail: NTIS HC A03/MF A01

The generalized Cauchy equations of motion are reviewed and differences in order of magnitude in equation terms are shown. By expanding the neighborhood around the material point a hierarchy of equations of motion is obtained. This set of equations follows as a matter of course by equating terms of the same order of magnitude. The stress tensor is symmetric, regardless of the occurrence of couple stresses. In the third level of localization, the microrotation is coupled with the curl of the acceleration. It is shown that grade n materials do not exist. Author (ESA)

80 SOCIAL SCIENCES (GENERAL)

Includes educational matters.

No abstracts in this category.

81 ADMINISTRATION AND MANAGEMENT

Includes management planning and research.

N82-25015* National Aeronautics and Space Administration, Washington, D. C.
MANAGEMENT: A CONTINUING BIBLIOGRAPHY WITH INDEXES
Mar. 1982 202 p
(NASA-SP-7500(16); NAS 1.21:7500(16)) Avail: NTIS HC $18.00 CSCL 05A

This bibliography lists 919 reports, articles, and other documents introduced into the NASA scientific and technical information system in 1981. Author

N82-25016*# National Aeronautics and Space Administration, Washington, D. C. Education Services Branch.
AEROSPACE TECHNICIANS: WE'RE TOMORROW-MINDED PEOPLE
Mary H. Lewis 1981 23 p refs Original contains color illustrations
(NASA-EP-187; NAS 1.19:187) Avail: NTIS HC A02/MF A01 CSCL 05A

Brief job-related autobiographical sketches of technicians working on NASA aerospace projects are presented. Career and educational guidance is offered to students thinking about entering the field of aerospace technology. R.J.F.

N82-25017*# National Aeronautics and Space Administration, Washington, D. C. Education Services Branch.
AEROSPACE ENGINEERS: WE'RE TOMORROW-MINDED PEOPLE
Mary H. Lewis 1981 39 p refs Original contains color illustrations
(NASA-EP-188; NAS 1.19:188) Avail: NTIS HC A03/MF A01 CSCL 05A

Brief job-related autobiographical sketches of engineers working on NASA aerospace projects are presented. Career and educational guidance is offered to students thinking about entering the aerospace field. R.J.F.

N82-25018*# National Aeronautics and Space Administration, Washington, D. C. Education Services Branch.
AEROSPACE SCIENTISTS. WE'RE TOMORROW-MINDED PEOPLE
Mary H. Lewis 1981 39 p refs Original contains color illustrations
(NASA-EP-189; NAS 1.19:189) Avail: NTIS HC A03/MF A01 CSCL 05A

Brief job-related autobiographical sketches of scientists working on NASA space science projects are presented. Career and educational guidance is offered to students thinking about entering the space science field. R.J.F.

N82-25019# Committee on Science and Technology (U. S. House).
EMERGENCY MANAGEMENT INFORMATION AND TECHNOLOGY
Washington GPO 1981 303 p Hearings before the Subcomm. on Invest. and Oversight of the Comm. on Sci. and Technol., 97th congr., 1st Sess., No. 55, 29-30 Sep. 1981
(GPO-88-582) Avail: Subcommittee on Investigations and Oversight

Emergency management is discussed. Telecommunications capabilities are assessed. The problems of information dissemination during emergencies is discussed. Data processing, decision making and security concerns are discussed. Natural disasters and war are considered. R.J.F.

N82-25020# Stanford Univ., Calif. Inst. for Mathematical Studies in the Social Sciences.
HOW RESTRICTIVE ACTUALLY ARE THE VALUE RESTRICTION CONDITIONS
Herve J. P. Raynaud Aug. 1981 12 p refs
(Contract N00014-79-C-0685)
(AD-A111669; TR-348) Avail: NTIS HC A02/MF A01 CSCL 05/10

It has already been shown that the 'value restriction conditions are in a certain sense the best possible conditions ensuring the transitivity of the majority method of decision in Sen (to appear); nevertheless, the actual restriction demanded by these conditions have not been yet clearly measured. GRA

N82-25021# Georgia Inst. of Tech., Atlanta. School of Information and Computer Science.
RESEARCH PROGRAM IN FULLY DISTRIBUTED PROCESSING SYSTEMS Quarterly Progress Report, 1 Jun. - 31 Aug. 1981
Oct. 1981 14 p refs
(Contracts N00014-79-C-0873; F30602-78-C-0120; F30602-81-C-0249; DAAG29-79-C-0155; DAAK70-79-D-0087; Grant NSF MCS-79-24370; GIT Proj. G36-647; GIT Proj. G36-652; GIT Proj. G36-643; GIT Proj. G36-654; GIT Proj. G36-659; GIT Proj. G36-638)
(AD-A111723; QPR-8) Avail: NTIS HC A02/MF A01 CSCL 09/2

The Georgia Tech Research Program in Fully Distributed Processing Systems is a comprehensive investigation of data processing systems in which both the physical and logical components are extremely loosely coupled while operating with a high degree of control autonomy at the component level. The definition of the specific class of multiple computer systems being investigated, and the operational characteristics and features of those systems is motivated by the desire to advance the state-of-the-art for that class of systems that will deliver a high proportion of the benefits currently being claimed for distributed processing systems. The scope of individual topics being investigated under this program ranges from formal modeling and theoretical studies to empirical examinations of prototype systems and simulation models. Also included within the scope of the program are areas such as the utilization of FDPS's and their interaction with management operations and structure. Author (GRA)

N82-25022# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
MADAM: MULTIPLE-ATTRIBUTE DECISION ANALYSIS MODEL, VOLUME 1 M.S. Thesis
Wayne Alan Stimpson Dec. 1981 171 p refs 2 Vol.
(AD-A111104; AFIT/GOR/AA/81D-1-Vol-1) Avail: NTIS HC A08/MF A01 CSCL 09/2

An on-line, real-time, computer based decision aid designed to assist the decision maker in clarifying preferences in a complex decision environment is described. It is applicable to problems which may be represented by a hierarchy of objectives to be satisfied. The program is MADAM: Multiple Attribute Decision Analysis Model, and it is written in FORTRAN V and is implemented on the CYBER 175 system. It is designed to aid the decision maker as he or she progresses through problem formulation, parameterization, sensitivity analyses, and a decision, including storage of all data and rationales. Deterministic problems are analyzed through multi-attribute-utility theory concepts and an additive value function is utilized for sensitivity analysis. A user's manual is included. R.J.F.

N82-25023# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Engineering.
MADAM: MULTIPLE-ATTRIBUTE DECISION ANALYSIS MODEL, VOLUME 2 M.S. Thesis
Wayne Alan Stimpson Dec. 1981 172 p 2 Vol.
(AD-A111105; AFIT/GOR/AA/81D-1-Vol-2) Avail: NTIS HC A08/MF A01 CSCL 09/2

This effort is an on-line, real-time, computer-based decision aid designed to assist the decision-maker in clarifying preferences

in a complex decision environment. It is applicable to problems which may be represented by a hierarchy of objectives to be satisfied. The program is MADAM: Multiple-Attribute Decision Analysis Model, and it is written in FORTRAN V and is implemented on the CYBER 175 system. MADAM is designed to aid the decision-maker as he or she progresses through problem formulation, parameterization, sensitivity analyses, and a decision, including storage of all data and rationales. Deterministic problems are analyzed through Multi-Attribute-Utility Theory concepts and an additive value function is utilized for sensitivity analysis. Pairwise preferential independence is tested between attributes. The work is divided into two volumes. Volume I is a theoretical presentation and includes a user's manual. It requires no programming expertise and may be used independently of Volume II. Volume II is a programming manual including the source code. GRA

N82-25024# Air Force Inst. of Tech., Wright-Patterson AFB, Ohio. School of Systems and Logistics.
PRODUCTIVITY MEASUREMENT IN RESEARCH AND DEVELOPMENT LABORATORIES M.S. Thesis
Thomas A. Fauth Sep. 1981 164 p refs
(AD-A111311; AFIT/LSSR-87-81) Avail: NTIS HC A08/MF A01 CSCL 05/1

This investigation consisted of a theoretical and empirical literature search and an extensive telephone interview process to identify the state-of-the-art R&D productivity indicators. The literature search (of publications from 1960 to the present) resulted in a chronological presentation of theoretical and empirical R&D productivity measurement methodologies and an expanded bibliography. The telephone interview process surveyed 14 Air Force, 30 Army, 20 Navy, and 21 industry laboratories. Specific literature and interview objective and subjective R&D productivity measurement indicators were identified and compared. Both objective and subjective productivity indicators were identified as the primary means of measuring laboratory productivity in the literature (empirical combined government and industry - 59%, theoretical combined government and industry - 46%) and from the interviews (government - 92%, industry - 62%). Status versus milestones, the degree technical objectives are reached, expenditures versus budget, and periodic reviews were the most common (of a standardized list of 18) indicators to both government and industry laboratories. Effectiveness is perceived as a more important component of productivity than efficiency. GRA

N82-24243# Centre National d'Etudes Spatiales, Toulouse (France).
ORGANIZATION OF A DATA PROCESSING PROJECT [ORGANISATION D'UN PROJET INFORMATIQUE DE REALISATION DE TRAITEMENT DES DONNEES]
D. Hermelin *In its* The Technol. of Spaceborne Sci. Expt. 1981 p 769-799 refs In FRENCH (For primary document see N82-24215 15-12)
Avail: NTIS HC A99/MF A01

N82-24244# Centre de Recherches en Physique de l'Environnement, Issy-les-Moulineaux (France).
OPERATION OF AN ONBOARD EXPERIMENT: OPERATIONAL ORGANIZATION AND DATA PROCESSING FOR THE GEOS PROJECT [EXPLOITATION D'UNE EXPERIENCE EMBARQUEE ORGANISATION DES OPERATIONS ET DU TRAITEMENT DES DONNEES. EXEMPLE DU PROJET GEOS]
B. delaPorte *In* CNES The Technol. of Spaceborne Sci. Expt. 1981 p 801-829 In FRENCH (For primary document see N82-24215 15-12)
Avail: NTIS HC A99/MF A01

N82-24375# Royal Netherlands Aircraft Factories Fokker, Schiphol-Oost. Space Div.
SERVING MANY DIFFERENT CUSTOMERS IN SPACE ACTIVITIES
H. B. Rouws *In* ESA 2nd ESA Prod. Assurance Symp. Jan. 1982 p 85-93 ref (For primary document see N82-24362 15-31)
Avail: NTIS HC A11/MF A01; ESA, Paris FF 140 Members States, AU, CN and NO (+20% others)

N82-24379# Centre National d'Etudes Spatiales, Toulouse (France).
SPACE COMPONENTS COORDINATION: RESULTS AND OUTLOOK
Henri Arciszewski *In* ESA 2nd ESA Prod. Assurance Symp. Jan. 1982 p 121-131 (For primary document see N82-24362 15-31)
Avail: NTIS HC A11/MF A01; ESA, Paris FF 140 Member States, AU, CN and NO (+20% others)

N82-24389# European Space Research and Technology Center, Noordwijk (Netherlands).
COMPONENT PROCUREMENT FOR ESA PROJECTS
U. Ernsberger *In* ESA 2nd ESA Prod. Assurance Symp. Jan. 1982 p 225-229 (For primary document see N82-24362 15-31)
Avail: NTIS HC A11/MF A01; ESA, Paris FF 140 Member States, AU, CN and NO (+20% others)

82 DOCUMENTATION AND INFORMATION SCIENCE

Includes information storage and retrieval technology; micrography; and library science.

For computer documentation see *61 Computer Programming and Software*.

No abstracts in this category.

83 ECONOMICS AND COST ANALYSIS

Includes cost effectiveness studies.

No abstracts in this category.

84 LAW AND POLITICAL SCIENCE

Includes space law; international law; international cooperation; and patent policy.

N82-25025# Committee on Science and Technology (U. S. House).
UNIFORM FEDERAL RESEARCH AND DEVELOPMENT UTILIZATION ACT OF 1981, PART 1
Fuqua Washington GPO [1982] 65 p refs Rept. to accompany H.R. 4564 presented by the Comm. on Sci. and Technol. at the 97th Congr., 1st Sess., 23 Sep. 1981
(H-Rept-97-379-Pt-1; GPO-87-268-Pt-1) Avail: US Capitol, House Document Room

Ownership rights to patents conceived under Federal contracts are discussed. Commercialization of inventions is considered, and retention of title to inventions by contractors recommended. Uniformity in patent policy among government agencies is also considered. N.W.

85 URBAN TECHNOLOGY AND TRANSPORTATION

Includes applications of space technology to urban problems; technology transfer; technology assessment; and surface and mass transportation.

For related information see *03 Air Transportation and Safety*, *16 Space Transportation*, and *44 Energy Production and Conversion*.

N82-25026# Mitre Corp., McLean, Va. METREK Div.
NON-CONTACTING SUSPENSION AND PROPULSION SYSTEMS FOR TRANSPORTATION APPLICATIONS
R. Katz, C. Swanson, and L. delCid May 1981 197 p refs (Contract DOT-RC-92053)
(PB82-135591; MTR-80W376; DOT/RSPA/DPB/25-81/16) Avail: NTIS HC A09/MF A01 CSCL 13F

Developments in non-contacting propulsion and/or suspension for urban and intercity ground transportation are discussed. The importance of electrotechnology in propulsion and suspension is discussed. GRA

88 SPACE SCIENCES (GENERAL)

N82-25027*# National Aeronautics and Space Administration, Washington, D. C.
B STARS WITH AND WITHOUT EMISSION LINES, PARTS 1 AND 2
Anne Underhill, ed. and Vera Doazan, ed. 1982 533 p refs In ENGLISH; FRENCH summary Prepared in cooperation with Centre National de la Recherche Scientifique, Paris
(NASA-SP-456; NAS 1.21:456; LC-82-2313) Avail: NTIS HC A23/MF A01 CSCL 03A

The spectra for B stars for which emission lines occur not on the main sequence, but only among the supergiants, and those B stars for which the presence of emission in H ahlpa is considered to be a significant factor in delineating atmospheric structure are examined. The development of models that are compatible with all known facts about a star and with the laws of physics is also discussed. For individual titles, see N82-25028 through N82-25038.

N82-25028*# National Aeronautics and Space Administration, Washington, D. C.
UNDERSTAND B-TYPE STARS **c89**
In its B Stars With and Without Emission Lines, Parts 1 and 2 1982 p 3-11 (For primary document see N82-25027 15-88)
Avail: NTIS HC A23/MF A01 CSCL 03A

When observations of B stars made from space are added to observations made from the ground and the total body of observational information is confronted with theoretical expectations about B stars, it is clear that nonthermal phenomena occur in the atmospheres of B stars. The nature of these phenomena and what they imply about the physical state of a B star and how a B star evolves are examined using knowledge of the spectrum of a B star as a key to obtaining an understanding of what a B star is like. Three approaches to modeling stellar structure (atmospheres) are considered, the characteristic properties of a mantle, and B stars and evolution are discussed. A.R.H.

N82-25029*# National Aeronautics and Space Administration, Washington, D. C.
INTRODUCING THE B STARS **c89**
In its B Stars With and Without Emission Lines, Part 1 and 2 1982 p 13-38 (For primary document see N82-25027 15-88)
Avail: NTIS HC A23/MF A01 CSCL 03A

Methods for classifying B stars in the visible region by examining low reslution spectra; broadband colors; intermidiate band colors and H beta; absolute magnitude as a function of H beta and H gamma strength and of luminosity class; and the BCD system and its relation to the MK system are examined. The use of OAO-2 spectrophotometry; objective prism and objective grating spectra; and observations from the TD1 satellite for classifying B stars in the ultraviolet region are also discussed. Infrared and radio observations of these stars are reviewed as well as information available concerning masses, radii and velocity of escape. A.R.H.

N82-25030*# National Aeronautics and Space Administration, Washington, D. C.
OBSERVATIONS OF NORMAL MAIN-SEQUENCE AND GIANT B STARS **c89**
In its B Stars With and Without Emission Lines, Parts 1 and 2 1982 p 39-77 (For primary document see N82-25027 15-88)
Avail: NTIS HC A23/MF A01 CSCL 03A

When interpreting the continuous and line spectra of B stars, it is helpful to think in terms of a model consisting of a photosphere and a mantle which is the outer part of the atmosphere where the effects of nonradiative heating are seen. A survey of the spectra of these stars shows that conditions in the photosphere determine most of what is seen, and in the case of most B stars, the presence of the mantle can be detected only by a special effort. The shape of the visible continuum spectrum and the shape and absolute value of the UV continuous spectrum as determined from low resolution spectra are discussed. Effective temperature for B stars in the main sequence, including corrections for interstellar extinction and bolometric corrections are explored. The major constituents of B-type spectra, variation of the strength of line along the main sequence band, the UV spectra, UV line blocking, intrinsic colors, and variations in light and spectra are also examined. A.R.H.

N82-25031*# National Aeronautics and Space Administration, Washington, D. C.
OBSERVATIONS OF B-TYPE SUPERGIANTS **c89**
In its B Stars With and Without Emission Lines, Parts 1 and 2 1982 p 79-146 (For primary document see N82-25027 15-88)
Avail: NTIS HC A23/MF A01 CSCL 03A

Methods are presented for determining the effective temperatures, radii and bolometric corrections for B-type supergiants. Absorption lines from hydrogen and from other elements, the H alpha, Balmer progression, and evidence for outflow from the invisible spectrum of these supergiants are considered. Luminosity effects, outflow velocities, and variability in the UV spectrum at high resolution are examined as well as the infrared and radio spectra. Spectroscopic characteristics of the peculiar supergiant P Cyg and superluminous supergiants; X-ray binaries; the properties of the photosphere and mantle; and mass loss are elaborated. A general model for the mantle of B stars is included and the properties of B type stars in the main sequence are compared with those of the B-type supergiants. A.R.H.

N82-25032*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SPECIAL TYPES OF B STARS **c90**
Janet Rountree Lesh *In* NASA, Washington B Stars With and Without Emission Lines, Parts 1 and 2 1982 p 147-163 (For primary document see N82-25027 15-88)
Avail: NTIS HC A23/MF A01 CSCL 03B

The properties of the Beta Cephei stars are examined with emphasis on spectral types, luminosities, periods, and light and velocity variations. Typical members of the group and their position in the observational and theoretical HR diagram are discussed. Those B stars with anomalous spectra (chemically peculiar) are considered including hot subdwarfs, extreme helium, weak helium, strong helium, helium variable, magnetic and mercury-manganese stars. A.R.H.

N82-25033*# National Aeronautics and Space Administration, Washington, D. C.
MODEL ATMOSPHERES, PREDICTED SPECTRA, AND COLORS **c90**
In its B stars With and Without Emission Lines, Parts 1 and 2 1982 p 165-197 (For primary document see N82-25027 15-88)
Avail: NTIS HC A23/MF A01 CSCL 03B

Theoretical models of stellar atmospheres and the process of forming a spectrum are reviewed with particular reference to the spectra of B stars. In the case of classical models the stellar atmosphere is though to consist of plane parallel layers of gas in which radiative and hydrostatic equilibrium exists. No radiative

energy is lost or gained in the model atmosphere, but the detailed shape of the spectrum is changed as a result of the interactions with the ionized gas. Predicted line spectra using statistical equilibrium local thermodynamic equilibrium (LTE), and non-LTE physics are compared and the determination of abunances is discussed. The limitations of classical modeling are examined. Models developed to demonstrate what motions in the upper atmosphere will do to the spectrum and to explore the effects of using geometries different from plane parallel layer are reviewed. In particular the problem of radiative transfer is addressed. M.G.

N82-25034*# National Aeronautics and Space Administration, Washington, D. C.
THE EVOLUTION OF MASSIVE STARS **c90**
In its B Stars With and Without Emission Lines, Parts 1 and 2 1982 p 199-229 (For primary document see N82-25027 15-88)
Avail: NTIS HC A23/MF A01 CSCL 03B

The hypotheses underlying theoretical studies of the evolution of massive model stars with and without mass loss are summarized. The evolutionary tracks followed by the models across theoretical Hertzsprung-Russell (HR) diagrams are compared with the observed distribution of B stars in an HR diagram. The pulsational properties of models of massive star are also described. M.G.

N82-25035*# National Aeronautics and Space Administration, Washington, D. C.
UNSOLVED PROBLEMS **c66**
In its B Stars With and Without Emission Lines, Parts 1 and 2 1982 p 231-256 (For primary document see N82-25027 15-88)
Avail: NTIS HC A23/MF A01 CSCL 12B

The level of understanding of the physics of single, isolated B stars is assessed and unresolved problems are defined. The significant observational results concerning the effective temperatures, radii, masses and mantles are summarized. The results of the theory of the evolution of massive stars are confronted with the observed luminosities and effective temperatures of B stars. In addition the implications of stellar spectra theory are compared with observed spectra and a heuristic model for a mantle is developed. The chief unresolved problems for B stars concern developing detailed models for (1) the internal structure of massive stars which are beginning to evolve rapidly as they complete burning hydrogen in their cores; (2) mantles; and (3) the transfer of radiation in high temperature inhomogeneous moving bodies of gas. M.G.

N82-25036*# National Aeronautics and Space Administration, Washington, D. C.
GROUND-BASED OBSERVATIONS AND AD HOC MODELS **c89**
In its B Stars With and Without Emission Lines, Parts 1 and 2 1982 p 285-374 (For primary document see N82-25027 15-88)
Avail: NTIS HC A23/MF A01 CSCL 03A

Ground based observations of B stars in the visible, the infrared, and the radio region are described along with the ad hoc models proposed to interpret them. It is shown that these observations refer essentially to the photosphere and to the regions of the outer atmosphere where the gas is cool and at low velocity. The characteristics of the variability of the continuous and line spectrum are examined in general and in the cases of individual stars. Finally, linear polarization in the B stars is discussed. M.G.

N82-25037*# National Aeronautics and Space Administration, Washington, D. C.
DATA OBTAINED FROM SPACECRAFT **c89**
In its B Stars With and Without Emission Lines, Parts 1 and 2 1982 p 375-407 (For primary document see N82-25027 15-88)
Avail: NTIS HC A23/MF A01 CSCL 03A

Data from spacecraft observations of B stars in the ultraviolet and X-ray spectral regions are presented. Superionization, mass flux, and the extended envelope are discussed in reference to ultraviolet line spectral. The problem of determining the ultraviolet flux of the B stars is examined. Spectral variations of gamma Cas and 59 Cyg are also discussed. M.G.

N82-25038*# Institut d'Astrophysique, Paris (France).
GLOBAL PICTURE OF A Be STAR **c89**
Richard N. Thomas *In* NASA, Washington B Stars With and Without Emission Lines, Parts 1 and 2 1982 p 409-451 (For primary document see N82-25027 15-88)
Avail: NTIS HC A23/MF A01 CSCL 03A

An attempt is made to synthesize the observational material on Be stars into a empirical pattern of atmospheric structure. The sequence of atmospheric regions is developed and empirical-numerical estimates of location and structure of the regions are described. Inferences are drawn concerning the general stellar structure required to generate the nonthermal fluxes which produce the observed atmospheric pattern. In particular the atmospheric and subatmospheric origins of mass flux are addressed. M.G.

N82-25039# European Space Agency, Paris (France). Space Science Dept.
REPORT ON THE ACTIVITIES OF SPACE SCIENCE DEPARTMENT IN 1980-1981 Annual Report, 1980-1981
D. E. Page, comp., B. Fitton, comp., A. Pedersen, comp., B. G. Taylor, comp., K.-P. Wenzel, comp., T. D. Guyenne, ed., E. Swallow, ed., and G. Levy, ed. Feb. 1982 82 p refs Original contains color illustrations
(ESA-SP-1042; ISSN-039-6566) Avail: NTIS HC A05/MF A01; ESA, Paris FF 60

Cosmic rays, plasma physics, astronomy and high energy astrophysics were studied. Solar and interplanetary proton propagation and acceleration are considered. An experiment for measuring charge spectra of ultraheavy, cosmic ray nuclei is described. Electric field data from ISEE 1 and GEOS 2 were analyzed. Atomic and ionic IR fine structure lines emitted by gaseous nebulae were also studied. The southern galactic plane in the CO(2-1) transition at 1.3 mm wavelength was surveyed. Data from the COS B spark chamber gamma-ray astronomy telescope were analyzed. Author (ESA)

89 ASTRONOMY

Includes radio and gamma-ray astronomy; celestial mechanics; and astrometry.

N82-25040*# Arizona Univ., Tucson. Optical Sciences Center.
TESTING OF THE KUIPER AIRBORNE OBSERVATORY 91-CM TELESCOPE Final Report
Robert E. Parks Jul. 1979 49 p refs
(Contract NAS2-10085)
(NASA-CR-166341; NAS 1.26:166341) Avail: NTIS HC A03/MF A01 CSCL 03A

The 91 cm telescope of the Kuiper Airborne Observatory was tested for optical figure errors in the surface of the mirrors and misalignment of the optical components. When the present set of optical components are installed in the telescope in proper alignment, the telescope produces an image with 80% of the energy in a circle of 1.50 arc seconds in diameter; that is, a 0.11 mm spot diameter in the focal plane. The primary mirror, an f/2 parabola, was tested against a flat and has a quality that puts 80% of the energy in a 0.51 arc second diameter spot. Two principal sources account for the residual error: the tertiary folding flat and the chopping secondary. It appears that the method of mounting the folding flat causes some distortion and that the secondary mirror has some residual spherical aberration in its figure. S.L.

N82-25028*# National Aeronautics and Space Administration, Washington, D. C.
UNDERSTAND B-TYPE STARS
In its B Stars With and Without Emission Lines, Parts 1 and 2 1982 p 3-11 (For primary document see N82-25027 15-88)
Avail: NTIS HC A23/MF A01 CSCL 03A

N82-25029*# National Aeronautics and Space Administration, Washington, D. C.
INTRODUCING THE B STARS
In its B Stars With and Without Emission Lines, Part 1 and 2 1982 p 13-38 (For primary document see N82-25027 15-88)
Avail: NTIS HC A23/MF A01 CSCL 03A

N82-25030*# National Aeronautics and Space Administration, Washington, D. C.
OBSERVATIONS OF NORMAL MAIN-SEQUENCE AND GIANT B STARS
In its B Stars With and Without Emission Lines, Parts 1 and 2 1982 p 39-77 (For primary document see N82-25027 15-88)
Avail: NTIS HC A23/MF A01 CSCL 03A

N82-25031*# National Aeronautics and Space Administration, Washington, D. C.
OBSERVATIONS OF B-TYPE SUPERGIANTS
In its B Stars With and Without Emission Lines, Parts 1 and 2 1982 p 79-146 (For primary document see N82-25027 15-88)
Avail: NTIS HC A23/MF A01 CSCL 03A

N82-25036*# National Aeronautics and Space Administration, Washington, D. C.
GROUND-BASED OBSERVATIONS AND AD HOC MODELS
In its B Stars With and Without Emission Lines, Parts 1 and 2 1982 p 285-374 (For primary document see N82-25027 15-88)
Avail: NTIS HC A23/MF A01 CSCL 03A

N82-25037*# National Aeronautics and Space Administration, Washington, D. C.
DATA OBTAINED FROM SPACECRAFT
In its B Stars With and Without Emission Lines, Parts 1 and 2 1982 p 375-407 (For primary document see N82-25027 15-88)
Avail: NTIS HC A23/MF A01 CSCL 03A

N82-25038*# Institut d'Astrophysique, Paris (France).
GLOBAL PICTURE OF A Be STAR
Richard N. Thomas *In* NASA, Washington B Stars With and Without Emission Lines, Parts 1 and 2 1982 p 409-451 (For primary document see N82-25027 15-88)
Avail: NTIS HC A23/MF A01 CSCL 03A

N82-24232# Centre National de la Recherche Scientifique, Marseilles (France). Lab. d'Astronomie Spatiale.
NEW OPTICAL SYSTEMS FOR TWO DIMENSIONAL OBSERVATION IN ASTRONOMY [NOUVEAUX SYSTEMES OPTIQUES POUR L'OBSERVATION BIDIMENSIONNELLE EN ASTRONOMIE]
M. P. Cruvellier *In* CNES The Technol. in Spaceborne Sci. Expt. 1981 p 523-537 refs In FRENCH (For primary document see N82-24215 15-12)
Avail: NTIS HC A99/MF A01

90 ASTROPHYSICS

Includes cosmology; and interstellar and interplanetary gases and dust.

N82-25041# Central Research Inst. for Physics, Budapest (Hungary). High Energy Physics Dept.
LIMITS ON NEUTRINO DEGENERACY FROM EARLY NUCLEOSYNTHESIS
A. S. Szalay Aug. 1980 11 p refs
(KFKI-1980-59; ISBN-963-371-693-4; HU-ISSN-0368-5330)
Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

The abundances of (4)He and (2)H are calculated in terms of the baryon density and neutrino degeneration, under the assumption, that the present dynamical properties of the Universe are determined by neutrinos, as it is suggested by recent measurements. It is shown that only a limited range of these parameters gives the abundances in agreement with observations. This provides a limit on both rho sub (B), the baryon density of the Universe, and xi, the neutrino degeneration parameter. These limits are $2.10(+31)$ g/cm(3) $<$ rho sub (b) $<$ $3.10(+3)0$ g/cm(3); $-0.2 < xi < 0.05$ which are in agreement with the observed amount of visible matter, rho* = $3.10(+3)$ g/cm(3), and the value xi = $10(+9)$, expected from SU(5) Grand Unification. DOE

N82-25032*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SPECIAL TYPES OF B STARS
Janet Rountree Lesh *In* NASA, Washington B Stars With and Without Emission Lines, Parts 1 and 2 1982 p 147-163 (For primary document see N82-25027 15-88)
Avail: NTIS HC A23/MF A01 CSCL 03B

N82-25033*# National Aeronautics and Space Administration, Washington, D. C.
MODEL ATMOSPHERES, PREDICTED SPECTRA, AND COLORS
In its B stars With and Without Emission Lines, Parts 1 and 2 1982 p 165-197 (For primary document see N82-25027 15-88)
Avail: NTIS HC A23/MF A01 CSCL 03B

N82-25034*# National Aeronautics and Space Administration, Washington, D. C.
THE EVOLUTION OF MASSIVE STARS
In its B Stars With and Without Emission Lines, Parts 1 and 2 1982 p 199-229 (For primary document see N82-25027 15-88)
Avail: NTIS HC A23/MF A01 CSCL 03B

91 LUNAR AND PLANETARY EXPLORATION

Includes planetology; and manned and unmanned flights.

For spacecraft design see *18 Spacecraft Design Testing, and Performance*. For space stations see *15 Launch Vehicles and Space Vehicles*.

N82-25042*# National Aeronautics and Space Administration. Pasadena Office, Calif.
ION MASS SPECTROMETER Patent Application
Marcia M. Neugebauer (JPL, California Inst. of Tech., Pasadena), Douglas R. Clay (JPL, California Inst. of Tech., Pasadena), Bruce E. Golstein (JPL, California Inst. of Tech., Pasadena), and Raymond Goldstein, inventors (to NASA) (JPL, California Inst. of Tech., Pasadena) Filed 24 Mar. 1982 16 p
(Contract NAS7-100)
(NASA-Case-NPO-15423-1; NASA-Case-NPO-15622-1; US-Patent-Appl-SN-361216) Avail: NTIS HC A02/MF A01 CSCL 03B

An ion mass spectrometer is described which detects and indicates the characteristics of ions received over a wide angle, and which indicates the mass to charge ratio, the energy, and the direction of each detected ion. The spectrometer includes a magnetic analyzer having a sector magnet that passes ions received over a wide angle, and an electrostatic analyzer positioned to receive ions passing through the magnetic analyzer. The electrostatic analyzer includes a two dimensional ion sensor at one wall of the analyzer chamber, that senses not only the lengthwise position of the detected ion to indicate its mass to charge ratio, but also detects the ion position along the width of the chamber to indicate the direction in which the ion was travelling. NASA

N82-25043*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
VIBRATIONAL-ROTATIONAL SPECTROSCOPY FOR PLANETARY ATMOSPHERES, VOLUME 1
Michael J. Mumma, ed., Kenneth Fox, ed. (Tennessee Univ.), and John Hornstein, ed. (Computer Sciences Corp.) Apr. 1982 416 p refs Proceedings of Workshop held at Annapolis, 17-19 Mar. 1980
(NASA-CP-2223-Vol-1; NAS 1.55:2223-Vol-1) Avail: NTIS HC A18/MF A01 CSCL 03B

Comprehensive information on the composition and dynamics of the varied planetary atmospheres is summarized. New observations resulted in new demands for supporting laboratory studies. Spectra observed from spacecraft used to interpret planetary atmospheric structure measurements, to aid in greenhouse and cloud physics calculations, and to plan future experiments are discussed. Current findings and new ideas of physicists, chemists, and planetry astronomers relating to the knowledge of the structure of things large and small, of planets

and of molecules are summarized. For individual titles, see N82-25044 through N82-25064.

N82-25044*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MOLECULAR SPECTROSCOPY AND PLANETARY EXPLORATION FROM SPACE
Rudolf A. Hanel *In its* Vibrational-Rotational Spectry. for Planetary Atmospheres, Vol. 1 Apr. 1982 p 29-47 refs (For primary document see N82-25043 15-91)
Avail: NTIS HC A18/MF A01 CSCL 03B

Examples of the role which molecular spectroscopy played in the interpretation of the thermal emission spectra of Earth, Mars, and Jupiter are given. Some advantages of molecular spectroscopy from a spacecraft passing close to a planet, or from an orbiter, over ground based techniques are discussed. Specifically the possibility of obtaining spectra over a wide spectral range (1) without the obscuring effect of Earth's atmosphere, (2) at much higher spatial resolution, and (3) from directions and with phase angles inaccessible from Earth. M.D.K.

N82-25045*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
RADIATIVE TRANSFER AND REMOTE SENSING
Barney J. Conrath *In its* Vibrational-Rotational Spectry. for Planetary Atmospheres, Vol. 1 Apr. 1982 p 47-62 refs (For primary document see N82-25043 15-91)
Avail: NTIS HC A18/MF A01 CSCL 03B

Radiative transfer, the basic theoretical tool for the quantitative interpretation of planetary infrared spectra, is discussed. The function it plays in linking the remotely sensed data to the properties of the atmosphere (composition, thermal structure, dynamics, etc.), is inferred. A brief overview of the remote sensing problem as it pertains to the interpretation of planetary spectra is presented. The presentation is tutorial rather than exhaustive. M.D.K.

N82-25046*# Texas Univ., Austin. Dept. of Astronomy.
RAYLEIGH, RAMAN AND PARTICULATE SCATTERING
William D. Cochran *In* NASA. Goddard Space Flight Center Vibrational-Rotational Spectry. for Planetary Atmospheres, Vol. 1 Apr. 1982 p 63-85 (For primary document see N82-25043 15-91)
(Grant NGR-77-012-152)
Avail: NTIS HC A18/MF A01 CSCL 03B

Analysis of the visible and near infrared spectra of planetary atmospheres and the multiple scattering of photons within the atmosphere are discussed. Photons detected within the spectral region are solar photons which were scattered by the gas and particles in the planetary atmosphere. An example is given for the incident and emitted fluxes for a hypothetical planet with an effective temperature of 100 K. The absorption spectrum of the planetary atmosphere is discussed in terms of the various scattering processes photons undergo within the atmosphere. Three different physical processes are considered. Rayleigh scattering and Raman scattering by the gas molecules, and scattering by any cloud or dust aerosol particles in the atmosphere. The physics of each of these processes is examined. M.D.K.

N82-25047*# Florida Univ., Gainesville. Dept. of Chemistry.
PREDICTION OF MOLECULAR INFRARED BAND AND LINE INTENSITIES
Willis B. Person *In* NASA. Goddard Space Flight Center Vibrational-Rotational Spectry. for Planetary Atmospheres, Vol. 1 Apr. 1982 p 89-124 refs (For primary document see N82-25043 15-91)
(Grant NSF CHE-78-18940)
Avail: NTIS HC A18/MF A01 CSCL 03B

The general problem of predicting infrared intensities is examined. The problem of predicting line intensities is discussed with attention focussed specifically on the problem of predicting vibrational strengths (or total band intensities). Two methods are considered: predictions based on ab initio quantum mechanical calculations, and predictions based on the transfer of atomic polar tensor parameters from small model molecules to the molecule of interest. Comparisons of predicted spectra with experimental spectra are shown for CH3OH, CH3OCH3, C2H5OH, and HOC2. It is suggested that the most important application of this work may be to the prediction of intensities for free radicals, ions, and reactive intermediates so that the infrared spectrum can be used in the quantitative analysis for these interesting species. M.D.K.

N82-25048*# Princeton Univ., N. J.
NEW THEORETICAL AND EXPERIMENTAL METHODS FOR PRESSURE BROADENED LINEWIDTHS AND THEIR INTERPRETATION
Jack J. Gelfand *In* NASA. Goddard Space Flight Center Vibrational-Rotational Spectry. for Planetary Atmospheres, Vol. 1 Apr. 1982 p 125-148 refs (For primary document see N82-25043 15-91)
Avail: NTIS HC A18/MF A01 CSCL 03B

A review of recent progress in the theory of collisional line broadening, particularly the impact of recent advances in collision dynamics calculations is presented. Some new approaches to the interpretation of experimentally measured linewidths and their impact on planetary atmosphere research are discussed. Experimental techniques which may have some advantage in providing pressure broadening data at very low temperatures are also mentioned. M.D.K.

N82-25049*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
LABORATORY MOLECULAR SPECTROSCOPY
Jack Margolis *In* NASA. Goddard Space Flight Center Vibrational-Rotational Spectry. for Planetary Atmospheres, Vol. 1 Apr. 1982 p 149-170 (For primary document see N82-25043 15-91)
Avail: NTIS HC A18/MF A01 CSCL 03B

The precision required in making spectroscopic measurements is discussed. Remarks are directed specifically to vibration-rotation spectra rather than continuum absorptions. The ultimate precision that is required for line positions is related to the width of the lines which may be no narrower than the Doppler width. The spectroscopic methods considered are those which are of the most general value to the astronomers; those which acquire and can handle large volumes of spectra in digital form, or in a form which is compatible with computer analysis, and in a form which is at least internally consistent. The use of dye laser, grating instruments, and the most versatile instrument for laboratory spectroscopy, the Fourier transform spectrometer is discussed. M.D.K.

N82-25050*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
MICROWAVE ROTATIONAL SPECTROSCOPY
Herbert Pickett *In* NASA. Goddard Space Flight Center Vibrational-Rotational Spectry. for Planetary Atmospheres, Vol. 1 Apr. 1982 p 171-190 refs (For primary document see N82-25043 15-91)
Avail: NTIS HC A18/MF A01 CSCL 03B

The region of planetary atmospheres upward of 1 millimeter is considered. The applications of this region, how microwave, millimeter, and submillimeter spectra (the so called rotational spectra) can fruitfully interact with infrared spectral measurements are described. Both the rotational bands and vibrational bands of molecules are considered. A typical rotational absorption coefficient for a linear molecule in a low J state with a dipole moment of about one Debye is plotted and evaluated. A vibrational case was chosen similarly: the transition dipole moment used for the vibrational case is typical of CO at the peak of its rotational distribution. Information on high altitude parameters that often cannot be obtained from higher frequency spectra, which can be provided by rotational spectra is discussed. M.D.K.

N82-25051*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE JPL MILLIMETER, SUBMILLIMETER AND MICROWAVE LINE CATALOG
Herbert Pickett *In* NASA. Goddard Space Flight Center Vibrational-Rotational Spectry. for Planetary Atmospheres, Vol. 1 Apr. 1982 p 191-196 (For primary document see N82-25043 15-91)
Avail: NTIS HC A18/MF A01 CSCL 03B

The catalog includes molecules of interest in the interstellar

medium, in planetary atmospheres and in the Earth's atmosphere. Different units than those on the AFGL tape are used. For citing line frequencies in the microwave region. Either the experimental errors or the propagation of errors from the fit are included on the tape. This gives an estimate of how accurate the frequencies are. The intensity units are defined as follows: the logarithm of the intensity unit is the cross section times the frequency in MHz. This is essentially the same unit as on the AFGL tape, but contains fewer factors of the speed of light. The catalog is available to the scientific community either as a tape or on microfiche (filmed in frequency sorted and molecule sorted format). T.M.

N82-25052*# Air Force Geophysics Lab., Hanscom AFB, Mass.
THE AFGL MOLECULAR LINE ATLASES
Laurence Rothman *In* NASA. Goddard Space Flight Center Vibrational-Rotational Spectry. for Planetary Atmospheres, Vol. 1 Apr. 1982 p 195-208 (For primary document see N82-25043 15-91)
Avail: NTIS HC A18/MF A01 CSCL 03B

There are two compilations: the main Atlas and the Trace Gas Atlas. The main Atlas includes the major absorbers in the Earth's atmosphere. The main Atlas includes about 150,000 lines (the Trace Gas Atlas is 30-40,000 at the moment). The information on each Atlas is essentially a card image per line, which includes the frequency (in vacuum wavenumbers) of the transition, the line strength at a standard temperature of 296 Kelvin, and the half width of the line. T.M.

N82-25053*# Arizona Univ., Tucson.
THERMAL BALANCE OF VENUS
Martin Tomasko *In* NASA. Goddard Space Flight Center Vibrational-Rotational Spectry. for Planetary Atmospheres, Vol. 1 Apr. 1982 p 211-228 (For primary document see N82-25043 15-91)
Avail: NTIS HC A18/MF A01 CSCL 03B

The Pioneer Venus mission measured several parameters of the atmosphere of Venus which pertain to its temperature structure and thermal balance. Among them are the temperature profile, the composition of the atmosphere, the solar fluxes throughout the atmosphere, and the thermal fluxes throughout the atmosphere. The atmosphere is shown to be essentially adiabatic below about 35 or 40 km, but from there up to the bottom of the lower cloud (at approximately 47 km altitude) there is a subadiabatic region. T.M.

N82-25054*# Texas A&M Univ., College Station.
NEUTRAL SPECIES IN THE ATMOSPHERE OF VENUS
Andrew Young *In* NASA. Goddard Space Flight Center Vibrational-Rotational Spectry. for Planetary Atmospheres, Vol. 1 Apr. 1982 p 229-242 (For primary document see N82-25043 15-91)
Avail: NTIS HC A18/MF A01 CSCL 03B

About 97% of the Venusian atmosphere is CO2, with the balance comprised of various trace constituents. Species other than CO2 that are found in Venus' atmosphere or are being sought are discussed. The problems connected with the spectrum of CO2 itself are highlighted. T.M.

N82-25055*# California Inst. of Tech., Pasadena.
TRANSIENT SPECIES ON MARS AND VENUS
Yuk L. Yung *In* NASA. Goddard Space Flight Center Vibrational-Rotational Spectry. for Planetary Atmospheres, Vol. 1 Apr. 1982 p 243-251 (For primary document see N82-25043 15-91)
Avail: NTIS HC A18/MF A01 CSCL 03B

The similarities between the atmospheres of Earth, Venus, and Mars are discussed. The following species are highlighted: NOx, HOx, and COx. The concentrations of the species were examined for all three planets. T.M.

N82-25056*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
GASEOUS INFRARED ABSORPTION IN THE LOWER ATMOSPHERE OF VENUS
C. Chackerian, Jr. and R. W. Boese *In* NASA. Goddard Space Flight Center Vibrational-Rotational Spectry. for Planetary Atmospheres, Vol. 1 Apr. 1982 p 255-269 refs (For primary document see N82-25043 15-91)
Avail: NTIS HC A18/MF A01 CSCL 03B

Possibly important sources of infrared opacity in the Venusian atmosphere was identified. It is shown that which is the major atmospheric constituent comprising about 97 percent of the atmosphere, is the dominant infrared opacity source. Not shown is N2 which comprises about 3 percent of the atmosphere. The mixing ratio of water vapor varies considerably with altitude but falls in the range of about 20 to 200 parts per million (ppm). The mixing ratio of SO2 falls in the range of 100-200 ppm. This number is about 5000 times larger than estimates obtained earlier via Earth-based observations. The abundance of some of the other minor constituents is also shown. T.M.

N82-25057*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE SPECTROSCOPY OF VENUS
Reinhard Beer *In* NASA. Goddard Space Flight Center Vibrational-Rotational Spectry. for Planetary Atmospheres, Vol. 1 Apr. 1982 p 271-293 (For primary document see N82-25043 15-91)
Avail: NTIS HC A18/MF A01 CSCL 03B

Problems in the spectroscopy of the planet are discussed. Two major problems are focused on: the almost total domination of the spectrum by CO2 (including almost every conceivable isotropic combination) makes the search for other species difficult; and the knowledge that no wavelengths short of the the microwave penetrate through the Venus cloud decks, which means that UV, visible, and IR remote sensing can investigate only the middle and upper atmosphere. The problem of intense multiple scattering is also considered. T.M.

N82-25058*# California Univ., Berkeley. Dept. of Physics.
SPECTROSCOPIC MEASUREMENTS OF MARS AND VENUS WITH HETERODYNE TECHNIQUES
Albert Betz *In* NASA. Goddard Space Flight Center Vibrational-Rotational Spectry. for Planetary Atmospheres, Vol. 1 Apr. 1982 p 277-294 refs (For primary document see N82-25043 15-91)
Avail: NTIS HC A18/MF A01 CSCL 03B

Measurements were made of the exact shape of CO2 absorption lines in Mars and Venus to determine the vertical pressure temperature structure using high resolution heterodyne spectroscopy. Accurate measurements of absolute wind velocities in both the mesosphere and stratosphere of Venus were made from Doppler shifts of narrow CO2 lines, and searches were made for minor molecular species of interest in modeling the stratospheric photochemistry for Mars and Venus. S.L.

N82-25059*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
INFRARED ABSORPTION BY OH CONTAINING COMPOUNDS
John J. Hillman *In its* Vibrational-Rotational Spectry. for Planetary Atmospheres, Vol. 1 Apr. 1982 p 295-310 refs (For primary document see N82-25043 15-91)
Avail: NTIS HC A18/MF A01 CSCL 03B

The spectroscopy of the species H2O, H2O2, and HO2 are discussed. Their vibration rotation transitions are emphasized, but the pure rotational transitions in the vibrational ground state of H2O are also considered since they contribute to opacity in the middle infrared region. S.L.

N82-25060*# National Bureau of Standards, Washington, D.C.
INFRARED ABSORPTION OF SULFUR BEARING COMPOUNDS
Arthur Maki *In* NASA. Goddard Space Flight Center Vibrational-Rotational Spectry. for Planetary Atmospheres, Vol. 1 Apr. 1982 p 311-330 refs (For primary document see N82-25043 15-91)
Avail: NTIS HC A18/MF A01 CSCL 03B

The sulfur bearing molecules of most interest in studies of planetary atmospheres are the simple, stable hydrides and oxides, H2S, H2SO4, SO2, and SO3, and the carbon containing species OCS and CO2. For interpreting spectroscopic observations, the properties that must be known are: transition frequencies, transition intensities, transition assignments in terms of quantum number assignments and lower state energy levels, and pressure broadening constants (including their temperature dependence). S.L.

N82-25061*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THERMAL STRUCTURE OF JUPITER AND SATURN
Glenn Orton *In* NASA. Goddard Space Flight Center Vibrational-Rotational Spectry. for Planetary Atmospheres, Vol. 1 Apr. 1982 p 333-362 (For primary document see N82-25043 15-91)
Avail: NTIS HC A18/MF A01 CSCL 03B

Temperatures in the sensible regions of the atmospheres of the outer planets are quite cold. The temperature structures for Jupiter, Saturn, Uranus and Neptune, derived from the equilibrium models are presented in preparation. The vertical temperature profiles for Jupiter and Saturn, the molecular spectroscopic data which form the basis for this type of analysis, and the problems involved with these models for molecular absorption and with the recovery technique in general, are discussed. Results for Jupiter and Saturn from the Pioneer and Voyager infrared experiments are also presented. S.L.

N82-25062*# Massachusetts Inst. of Tech., Cambridge.
COMPOSITION OF JUPITER
Ronald Prinn *In* NASA. Goddard Space Flight Center Vibrational-Rotational Spectry. for Planetary Atmospheres, Vol. 1 Apr. 1982 p 363-385 (For primary document see N82-25043 15-91)
Avail: NTIS HC A18/MF A01 CSCL 03B

The chemistry of Jupiter's atmosphere is reviewed. The various molecules that were discovered on Jupiter are summarized. The compounds: methane, ammonia water, ethane, acetylene, carbon monoxide, phosphine, and germane. S.L.

N82-25063*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
VOYAGER IRIS MEASUREMENTS OF THE JOVIAN ATMOSPHERE
Virgil G. Kunda *In its* Vibrational-Rotational Spectry. for Planetary Atmospheres, Vol. 1 Apr. 1982 p 387-405 refs (For primary document see N82-25043 15-91)
Avail: NTIS HC A18/MF A01 CSCL 03B

The Jovian atmospheric observations from the Voyager infrared investigation are reviewed. Several spectroscopic problem areas presently limiting scientific interpretation of the data are emphasized. S.L.

N82-25064*# Arizona Univ., Tucson.
JUPITER AND SATURN FROM 2 TO 6 MICRONS
Harold P. Larson *In* NASA. Goddard Space Flight Center Vibrational-Rotational Spectry. for Planetary Atmospheres, Vol. 1 Apr. 1982 p 407-427 refs (For primary document see N82-25043 15-91)
(Grant NGR-03-002-332)
Avail: NTIS HC A18/MF A01 CSCL 03B

Earth based spectroscopic observations that support current compositional and structural analyses of planetary atmospheres are summarized. The overview of Jupiter's IR spectrum illustrates a fundamental constraint to observations of the outer planets: atmospheric studies are restricted to narrow, isolated windows defined by the planetary absorbers H2, CH4, NH3, and PH3. Some of these planetary windows, such as at 1.6 micron are accessible in ground based observations, but others, such as at 1.9 and 2.7 micron are totally obscured by terrestrial H2O. For this reason, high altitude sites, such as aircraft, balloons, and spacecraft, are essential for IR spectral studies of the outer planets. S.L.

N82-25065*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
JOVIMAGNETIC SECULAR VARIATION
J. E. P. Connerney and M. H. Acuna Mar. 1982 14 p refs Submitted for publication
(NASA-TM-83919; NAS 1.15:83919) Avail: NTIS HC A02/MF A01 CSCL 03B

Long term variations of a planetary magnetic field are one of the few observables available in the study of planetary interiors and dynamo theory. While variations of the geomagnetic field were accessible to direct measurement for centuries, knowledge of the secular variations of other planetary dynamos is limited. New limits on Jovimagnetic secular variations were found by comparison of a Jovian internal field model obtained from the Voyager 1 magnetic field observations at epoch 1979.2 with the epoch 1974.9 Pioneer 11 O4 model. No significant secular variation of either the magnitude or position of the Jovidipole is found for the years 1974.9 through 1979.2, although a small Earth-like variation cannot be ruled out. Author

N82-25066*# Brown Univ., Providence, R. I. Dept. of Geological Sciences.
SIGNIFICANT ACHIEVEMENTS IN THE PLANETARY GEOLOGY PROGRAM, 1981 Summary Report
Peter J. Mouginis-Mark Washington NASA May 1982 64 p (Contract NsG-7570)
(NASA-CR-3554; NAS 1.26:3554) Avail: NTIS HC A04/MF A01 CSCL 03B

Recent developments in planetology research are summarized. Important developments are summarized in topics ranging from solar system evolution, comparative planetology, and geologic processes, to techniques and instrument development for future exploration. R.J.F.

N82-25067*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
THE VIKING MOSAIC CATALOG, VOLUME 2
Nancy Evans Washington NASA Mar. 1982 672 p (Contract NAS7-100)
(NASA-CR-3496-Vol-2; NAS 1.26:3496-Vol-2) Avail: NTIS HC A99/MF A01 CSCL 03B

A collection of more than 500 mosaics prepared from Viking Orbiter images is given. Accompanying each mosaic is a footprint plot, which identifies by location, picture number, and order number, each frame in the mosaic. Corner coordinates and pertinent imaging information are also included. A short text provides the camera characteristics, image format, and data processing information necessary for using the mosaic plates as a research aide. Procedures for ordering mosaic enlargements and individual images are also provided. R.J.F.

N82-25068# Technische Universitaet, Munich (West Germany). Lehrstuhl fuer Raumfahrttechnik.
COMET DUST COLLECTION EXPERIMENTS IN MUNICH
Peter Lell Apr. 1981 18 p refs
(TUM-RT-TB-81/2) Avail: NTIS HC A02/MF A01

Laboratory simulation of comet dust collection is described. An electromagnetic accelerator drives 5 to 250 micron diameter glass beads onto gold and aluminum targets at speeds between 5 and 200 m/sec. Particle adhesion is tested by placing the targets in an ultracentrifuge. Surface roughness effects on adhesion were examined. Grooved gold targets show good adhesion, and concentrate particle distribution. Sandblasted and sandpapered surfaces make adhesion easier, but make finding the particles more difficult. A higher percentage of particles hitting targets in multilayer formations adhere, compared to single particles. Author (ESA)

92 SOLAR PHYSICS

Includes solar activity, solar flares, solar radiation and sunspots.

N82-25069*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SUNSPOT VARIATION AND SELECTED ASSOCIATED PHENOMENA: A LOOK AT SOLAR CYCLE 21 AND BEYOND
Robert M. Wilson Feb. 1982 38 p refs
(NASA-TM-82474; NAS 1.15:82474) Avail: NTIS HC A03/MF A01 CSCL 03B

Solar sunspot cycles 8 through 21 are reviewed. Mean time intervals are calculated for maximum to maximum, minimum to minimum, minimum to maximum, and maximum to minimum phases for cycles 8 through 20 and 8 through 21. Simple cosine functions with a period of 132 years are compared to, and found to be representative of, the variation of smoothed sunspot numbers at solar maximum and minimum. A comparison of cycles 20 and 21 is given, leading to a projection for activity levels during the Spacelab 2 era (tentatively, November 1984). A prediction is made for cycle 22. Major flares are observed to

peak several months subsequent to the solar maximum during cycle 21 and to be at minimum level several months after the solar minimum. Additional remarks are given for flares, gradual rise and fall radio events and 2800 MHz radio emission. Certain solar activity parameters, especially as they relate to the near term Spacelab 2 time frame are estimated. Author

N82-25070*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
STATISTICAL ASPECTS OF THE 1980 SOLAR FLARES. 2: SOLAR CYCLE ACTIVITY RELATIONSHIPS AND ADDITIONAL REMARKS
Robert M. Wilson Feb. 1982 55 p refs
(NASA-TM-82475; NAS 1.15:82475) Avail: NTIS HC A04/MF A01 CSCL 03B

Based on 1349 hydrogen alpha flares with X-ray counterparts, an investigation into the relationship between the rise time, decay time, duration, latitude, hydrogen alpha importance, and X-ray class with 2800 MHz radio emission (F2800) was accomplished. An important finding is that during 1980 both the number of hydrogen alpha importance class 1 and number of X-ray class M (and M+X) flares appeared to be rather strongly related to F2800, in a positive sense; i.e., number of class 1 and class M events increased as F2800 increased. R.J.F.

N82-25071# Aerospace Corp., El Segundo, Calif. Space Sciences Lab.
ANALYSIS OF A SERIES OF SOLAR FLARE X-RAY SPECTRA
D. L. McKenzie and P. B. Landecker 1 May 1981 42 p refs (Contract F04701-80-C-0081)
(AD-A099475; SD-TR-81-41; TR-0081(6960-01)-5) Avail: NTIS HC A03/MF A01 CSCL 03/2

Thirteen X-ray line spectra (7.8 to 23.0 A) acquired during a solar flare that peaked at 2326 UT were analyzed. The data include fluxes of lines excited throughout the temperature range present in the coronal flare. The coronal flare emission measure began to decrease 500 s or less after the broad band X-ray flux peaked. The differential emission measure was calculated from the data by using collision strengths for a small number of the observed lines. S.L.

N82-25072# Aerospace Corp., El Segundo, Calif.
SOLAR FLARE X-RAY SPECTRA BETWEEN 7.8 AND 23.0 ANGSTROMS
D. L. McKenzie, P. B. Landecker, R. M. Broussard, H. R. Rugge, R. M. Young, U. Feldman (E. O. Hulbert Center for Space Research, Washington, D.C.), and G. A. Doschek (E. O. Hulbert Center for Space Research, Washington, D.C.) 1 Apr. 1981 34 p refs (Contract F04701-80-C-0081)
(AD-A098779; SD-TR-81-34; TR-0081(6960-01)-2) Avail: NTIS HC A03/MF A01 CSCL 03/2

High resolution X-ray spectra taken during a large solar flare on 10 June 1979 are presented. Many lines of highly ionized iron were resolved and identified for the first time in solar spectra. Lines with a wide range of excitation temperatures are found to have a similar time development during the flare's rapid rise phase. The density-sensitive line ratios in Fe(XXI) and Fe(XXII) are discussed. Author

N82-25073# Hulburt (E. O.) Center for Space Research, Washington, D.C.
HIGH RESOLUTION SOLAR FLARE X-RAY SPECTRA: THE TEMPORAL BEHAVIOR OF ELECTRON DENSITY, TEMPERATURE, AND EMISSION MEASURE FOR TWO CLASS M FLARES
G. A. Doschek, U. Feldman, P. B. Landecker (Aerospace Corp., El Segundo, Calif.), and D. L. McKenzie (Aerospace Corp., El Segundo, Calif.) 15 Jun. 1981 38 p refs
(AD-A101571; SD-TR-81-52; TR-0081(6960-01)-4) Avail: NTIS HC A03/MF A01 CSCL 03/2

High resolution soft X-ray flare spectra recorded by crystal spectrometers flown on an orbiting spacecraft (P78-1) are combined and analyzed. The spectra of two flares are analyzed. Temporal coverage for both flares, including the rise and decay phases, is discussed. Measurements of electron density were obtained throughout most of the lifetimes of the two flares. Electron temperature as a function of time is determined from the Fe and Ca spectra. Differential emission measures and volume emission measures are determined for the low and high temperature (Fe, Ca) plasma. The relationship of the low and high temperature regions is discussed. N.W.

N82-25074*# Stanford Univ., Calif. Inst. for Plasma Research.
STRUCTURE OF THE SOLAR OSCILLATION WITH PERIOD NEAR 160 MINUTES
Philip H. Scherrer and John M. Wilcox Feb. 1982 17 p refs (Grant NGR-05-020-559)
(NASA-CR-168911; NAS 1.26:168911; SU-IPR-865) Avail: NTIS HC A02/MF A01 CSCL 03B

The solar oscillation with period near 160 minutes is found to be unique in a spectrum computed over the range of periods from about 71 to 278 minutes. A best estimate of the period is 160.0095 + or - 0.001 minutes, which is different from 160 minutes (one ninth of a day) by a highly significant amount. The width of the peak is approximately equal to the limiting resolution that can be obtained from an observation lasting 6 years, which suggests that the damping time of the oscillations is considerably longer than 6 years. A suggestion that this peak might be the result of a beating phenomenon between the five minute data averages and a solar oscillation with period near five minutes is shown to be incorrect by recomputing a portion of the spectrum using 15 second data averages. R.J.F.

N82-25075*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
HELIUM, HYDROGEN, AND OXYGEN VELOCITIES OBSERVED ON ISEE-3
Keith W. Ogilvie, M. A. Coplan (Maryland Univ., College Park), and R. D. Zwicki (LASL) Mar. 1982 21 p refs Submitted for publication Sponsored in part by Maryland Univ.
(Contract NAS5-25472)
(NASA-TM-83920; NAS 1.15:83920) Avail: NTIS HC A02/MF A01 CSCL 03B

The velocities of hydrogen, helium, and oxygen ions over a full range of solar wind conditions were recorded by the ion composition instrument and Los Alamos National Laboratory plasma instrument aboard the International Sun Earth Explorer. Interspecie velocity differences were observed frequently. For solar wind velocities between 300 and 400 km s(-1) the helium velocity exceeded the hydrogen velocity by 5 km s(-1) the average difference was 14 km s(-1), however no evidence was found for a nonzero average velocity difference between helium and oxygen ions even at the higher velocities. Velocity differences were examined in a number of streams and across a number of interplanetary shocks. Generally helium hydrogen velocity differences are bounded by the Alfven speed. Velocity differences show abrupt changes across interplanetary discontinuities, presumably tangential. The electrostatic potential change across a shock produces differences between the velocities of ions having different charges. B.W.

N82-25076# Observatoire de Paris-Meudon (France).
FORUM ON SOLAR ACTIVITY [FORUM ACTIVITE SOLAIRE]
1981 129 p refs Partly in FRENCH and ENGLISH Proc. held at Meudon, France, 2 Nov. 1981; sponsored by Conseil Scientifique de l'Observatoire de Paris
Avail: NTIS HC A07/MF A01

Observations of solar activity are discussed with emphasis on implications for astrophysics and plasma physics. Solar flares are of prime focus, including spectroscopic diagnostics, structure, and physical mechanisms. The determination of flare related magnetic fields, particle acceleration in flares, and solar radio emission accompanying flares are covered. Solar flare theoretical models and the propagation of collisionless shocks in the interplanetary medium was also treated. For individual titles, see N82-25077 through N82-25085.

N82-25077# Observatoire de Paris-Meudon (France).
WHY SOLAR FLARES ARE STUDIED [POURQUOI ETUDIER LES ERUPTIONS SOLAIRES?]
Andre Mangeney *In its* Forum on Solar Activity 1981 4 p In FRENCH (For primary document see N82-25076 15-92)
Avail: NTIS HC A07/MF A01

Solar flare phenomena of interest in astrophysics and plasma physics are discussed. The situation is considered where a dense region (solar envelope) whose motion is controlled by essentially nonmagnetic processes, e.g., convective instabilities, tranfers nonradiative energy to a tenuous region (solar atmosphere) whose motion, on the contrary, is controlled by the magnetic field. A dimensional analysis of the equation of motion is shown in terms of the beta parameter. A force-free magnetic field in the atmosphere is arrived at. Evaluation of force-free equilibria gives the potential field. Motion in the envelope incessantly modifies the magnetic field configuration, while free energy is stored in the atmosphere. Unanswered questions as to the characterization of the dissipation of this energy are evoked.
Author (ESA)

N82-25078*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
FLARES AND DYNAMIC ASPECTS [ERUPTIONS ET ASPECTS DYNAMIQUES]
Einar Tandberg Hanssen *In* Obs. de Paris-Meudon Forum on Solar Activity 1981 13 p refs In FRENCH (For primary document see N82-25076 15-92)
Avail: NTIS HC A07/MF A01

Theory of the dynamic nature of solar flares, eruptive prominences, and coronal transients is surveyed. Two types of flare are considered: compact eruptions (small flares) which are probably loops, and large eruptions of double filament flares. The physical sense of this classification is justified, using solar observations. Even leaving the question unanswered of whether a coronal transient is a loop of ejected matter or a shock wave, the important, perhaps fundamental, role of mass motion in flare physics is evidenced. Author (ESA)

N82-25079# Observatoire de Nice (France).
SPECTROSCOPIC DIAGNOSTICS OF SOLAR FLARES [DIAGNOSTICS SPECTROSCOPIQUES DES ERUPTIONS SOLAIRES]
F. Bely-Dubau, Jacques Dubau (Observatoire de Paris-Meudon), P. Faucher, M. Loulergue (Observatoire de Paris-Meudon), and L. Steeman-Clarke *In* Obs. de Paris-Meudon Forum on Solar Activity 1981 14 p refs In FRENCH (For primary document see N82-25076 15-92)
Avail: NTIS HC A07/MF A01

Observations made with the X-ray polychromator (XRP) on board the Solar Maximum Mission satellite were analyzed. Data from the bent crystal spectrometer portion of the XRP experiment, in the spectral domain 1 to 3 A, with high spectral and temporal resolution, were used. Results for the spectrum analysis of iron are given. The possibility of polarization effects is considered. Although it is demonstrated that hyperfine analyses of a given spectrum are obtainable, provided calculations include large quantities of high precision atomic data, the interpretation is limited by the hypothesis of homogeneity of the emitting plasma. Author (ESA)

N82-25080# Observatoire de Meudon (France). Dept. d'Astrophysique Fondamentale.
DETERMINATION OF MAGNETIC FIELDS AND ANISOTROPIES OF A MILIEU FROM INTERPRETATION OF THE LINEAR POLARIZATION OF LINES [DETERMINATION DES CHAMPS MAGNETIQUES ET DES ANISOTROPIES DU MILIEU A PARTIR DE L'INTERPRETATION DE LA POLARISATION LINEAIRE DES RAIES]
Sylvie Sahal-Brechot *In* Obs. de Paris-Meudon Forum on Solar Activity 1981 28 p refs In FRENCH (For primary document see N82-25076 15-92)
Avail: NTIS HC A07/MF A01

Research in atomic physics was applied to polarimetric observations of solar prominences and flares. Attempts to measure both the magnetic field in magnitude and direction of the magnetic field as well as the velocity field are described. Two causes behind the global polarization of a line are explained: excitation by a directional ray, and directional collisions. Causes which can lead to a modification of this global polarization, particularly by a magnetic field (Hanle effect), are examined. While interpretation of the Hanle effect gives a measure of the magnetic field vector, analysis of the polarization of a line profile provides information on the velocity field vector, arriving at a simultaneous vector detection scheme. Author (ESA)

N82-25081# Observatoire de Meudon (France). Dept. d'Astronomie Solaire et Planetaire.
THE SITES OF SOLAR FLARES [LES SITES ERUPTIFS]
Pierre Mein *In* Obs. de Paris-Meudon Forum on Solar Activity 1981 7 p refs In FRENCH (For primary document see N82-25076 15-92)
Avail: NTIS HC A07/MF A01

Observations of solar flares were studied. Results on the magnetic field structure associated with an elementary flare are discussed. Conditions which prelude the triggering of instabilities (homologous flares, disappearance of filaments) are covered. The postflare relaxation phase is also considered. Linear polarization of lines during flare events and the variable geometry of magnetic field lines (mass ejection dynamics) are treated. The importance of continuous observation over several hours in interpreting these events is shown. Author (ESA)

N82-25082# Birmingham Univ. (England). Dept. of Space Research.
PARTICLE ACCELERATION IN SOLAR FLARES
George M. Simnett *In* Obs. de Paris-Meudon Forum on Solar Activity 1981 21 p refs (For primary document see N82-25076 15-92)
Avail: NTIS HC A07/MF A01

Some contemporary problems relating to the acceleration of charged particles in solar flares are discussed including the how, when, and where of the acceleration. Particular emphasis is given to electron acceleration since electrons are more easily detected via the radiation produced in their interaction with plasma, and magnetic fields. Acceleration in both the impulsive phase and in a shock induced second stage is outlined together with the controversy between thermal and nonthermal processes. Results of studies made during the last solar maximum are considered, together with more recently available spatially resolved radio data, and similar X-ray data from the Solar Maximum Mission. Proton acceleration in the impulsive phase is discussed in relation to the gamma radiation it stimulates. If the corona is an acceleration site, the manifestations of flares so well observed at the lower energies, (optical, EUV, soft X-ray) may well be truly secondary processes with the primary energy release site and particle acceleration region quite remote. A.R.H.

N82-25083# Observatoire de Meudon (France). Dept. d'Astronomie Solaire et Planetaire.
METRIC EMISSIONS IN CONJUNCTION WITH SOLAR ACTIVITY [EMISSIONS METRIQUES EN LIAISON AVEC L'ACTIVITE SOLAIRE]
Pierre Lantos *In* Obs. de Paris-Meudon Forum on Solar Activity 1981 7 p refs In FRENCH (For primary document see N82-25076 15-92)
Avail: NTIS HC A07/MF A01

The temporal sequence as well as localization of the acceleration and injection of electrons necessary for the emission of solar radio bursts are considered. Results obtained with the radioheliograph at Nancy are used along with observations from ISEE 3 and the Solar Maximum Mission. Coronal structures where bursts occur are identified. Parameters, such as evolution, magnetic field, and density, which can be studied by radio astronomy are discussed. Type 3 bursts are associated with the preeruptive and impulsive phases of a flare, while type 2 and 4 bursts go with a flare continuum. A noise storm accompanies the final phase. Author (ESA)

N82-25084# Observatoire de Meudon (France). Dept. d'Astronomie Solaire et Planetaire.
SHOCK WAVES IN THE INTERPLANETARY MEDIUM [LES ONDES DE CHOC DANS LE MILIEU INTERPLANETAIRE]
Yolande Leblanc *In* Obs. de Paris-Meudon Forum on Solar Activity 1981 10 p refs In FRENCH (For primary document see N82-25076 15-92)
Avail: NTIS HC A07/MF A01

Interplanetary space is characterized as a homogeneous medium, entirely ionized, through which the solar wind flows. Different types of shock waves are described, i.e., stationary, or quasi-stationary, and progressive. The features of these shock

waves are elucidated, including the Rankine-Hugoniot equations, propagation velocity, discontinuities, and energy dissipation. Observations made by ISEE and Voyager spacecraft are cited. Correlations between type 2 radio bursts and interplanetary shock waves are revealed. Author (ESA)

N82-25085# Paris VII (France).
RECENT DEVELOPEMENTS IN SOLAR FLARE MODELS [DEVELOPEMENTS RECENTS DANS LES MODELES D'ERUPTION]
Jean Heyvaerts *In* Obs. de Paris-Meudon Forum on Solar Activity 1981 21 p refs In FRENCH Prepared in cooperation with Inst. d'Astrophysique, Paris (For primary document see N82-25076 15-92)
Avail: NTIS HC A07/MF A01

Theoretical models which explain why and how solar flares occur are surveyed. Processes that govern the dissipation of magnetic energy are considered fundamental. The storage of magnetic energy and what produces its violent conversion into thermal and suprathermal energy are considered. A magnetic model of a flare which is presented comprises three phases: a stable flare buildup phase evolves into an impulsive phase which leads to the principle phase of a flare phenomenon. The stability of the preeruptive state and current sheets is discussed as well as the thermal equilibrium of the preeruptive structure. Reconnection in the preeruptive state and the occurence of spontaneous reconnection are treated. Results show that reconnection can have different geometries and, hence, can provoke nonlinear developments of widely varying magnitudes in the context of the solar corona. Author (ESA)

93 SPACE RADIATION

Includes cosmic radiation and inner and outer earth's radiation belts.

For biological effects of radiation see *52 Aerospace Medicine*. For theory see *73 Nuclear and High-Energy Physics*.

N82-25086*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A BROAD-BAND VLF-BURST ASSOCIATED WITH RING-CURRENT ELECTRONS
Kaichi Maeda Mar. 1982 26 p refs Submitted for publication
(NASA-TM-83923; NAS 1.15:83923) Avail: NTIS HC A03/MF A01 CSCL 03B

Frequency band broadening takes place just outside of the nighttime plasmasphere, where the density of cold plasma is known to be very low during the later phase of a geomagnetic storm. Instead of the gradual broadening of several hours duration, a burst type broadening of VLF emission lasting less than ten minutes was observed by Explorer 45 in a similar location. The magnetic field component of this emission is very weak and the frequency spreads below the local half electron cyclotron frequency. Corresponding enhancement of the anisotropic ring current electrons is also very sudden and limited below the order of 10 keV without significant velocity dispersion, in contrast to the gradual broadening events. The cause of this type of emission band spreading can be attributed to the generation of the quasielectrostatic whistler mode emission of short wavelength by hot bimaxwellian electrons surging into the domain of relatively low density magnetized cold plasma. The lack of energy dispersion in the enhanced electrons indicates that the inner edge of the plasma sheet, the source of these hot electrons, is not far from the location of this event. A.R.H.

N82-25087*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SPECTRA OF COSMIC X-RAY SOURCES
Stephen S. Holt and Richard McCray Feb. 1982 75 p refs Submitted for publication
(NASA-TM-83898; NAS 1.15:83898) Avail: NTIS HC A04/MF A01 CSCL 03B

X-ray measurements provide the most direct probes of astrophysical environments with temperatures exceeding one million K. Progress in experimental research utilizing dispersive techniques (e.g., Bragg and grating spectroscopy) is considerably slower than that in areas utilizing photometric techniques, because of the relative inefficiency of the former for the weak X-ray signals from celestial sources. As a result, the term 'spectroscopy' as applied to X-ray astronomy has traditionally satisfied a much less restrictive definition (in terms of resolving power) than it has in other wavebands. Until quite recently, resolving powers of order unity were perfectly respectable, and still provide (in most cases) the most useful spectroscopic data. In the broadest sense, X-ray photometric measurements are spectroscopic, insofar as they represent samples of the overall electromagnetic continua of celestial objects. S.L.

N82-25088*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ON THE ACCELERATION OF IONS BY INTERPLANETARY SHOCK WAVES. 1: SINGLE ENCOUNTER CONSIDERATIONS
Mark E. Pesses (Iowa Univ., Iowa City) Dec. 1981 37 p refs Submitted for publication Sponsored in part by ONR
(Contract NAS2-GS53)
(NASA-TM-83913; NAS 1.15:83913) Avail: NTIS HC A03/MF A01 CSCL 03B

The acceleration of energetic ions in interplanetary magnetosonic fast-mode shock waves was studied via analytical modeling and numerical simulations. An analytical model that combines both the shock drift and compressional acceleration mechanisms is presented. The analytical predictions of the model are shown to be in good agreement with numerical simulation results. Author

N82-25089*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ON THE ACCELERATION OF IONS BY INTERPLANETARY SHOCK WAVES. 3: HIGH TIME RESOLUTION OBSERVATIONS OF CIR PROTON EVENTS
Mark E. Pesses, J. A. VanAllen (Iowa Univ., Iowa City), B. T. Tsurutani (JPL), and E. J. Smith (JPL) Dec. 1981 35 p refs Submitted for publication Sponsored in part by ONR
(Contracts NAS2-6553; NAS7-100)
(NASA-TM-83914; NAS 1.15:83914) Avail: NTIS HC A03/MF A01 CSCL 03B

Observations within + or - 3 hours of corotating interaction region (CIR) shock waves of proton intensities, pitch angle distribution and crude differential energy spectra of the range of $0.6 < E$ sub p 3.4 MeV are presented. The principle result is the evidence for the persistent flow of particles away from the shock. The observations are found to be in good agreement with the hypothesis of local interplanetary shock acceleration by the shock drift and compression mechanisms. The same set of observations strongly suggest that transit time damping does not play an important role in the acceleration of protons to 1 MeV in the immediate vicinity of CIR shocks. Author

N82-25090# Central Research Inst. for Physics, Budapest (Hungary).
HOW DOES THE GLOBAL STRUCTURE OF THE INTERPLANETARY MAGNETIC FIELD EFFECT COSMIC RAY MODULATION
J. Kota Oct. 1980 5 p refs
(KFKI-1980-72) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

Force field theory is studied in three dimensions using the full diffusion tensor incorporating drift effects. An analytical approximate solution is deduced under some assumptions which include a flat neutral sheet and a nonuniform density distribution at the outer boundary. By contrast with the usual force field theory, the solution gives a large and charge dependent latitudinal gradient and near perfect isotropy, even corotation disappears. DOE

N82-25091# Central Research Inst. for Physics, Budapest (Hungary).
INTERPLANETARY TRANSPORT OF SOLAR COSMIC RAYS
Tamas I. Gombosi and Aaron J. Owen (Delaware Univ.) Jul. 1980 9 p refs Submitted for publication

(KFKI-1980-46; ISSN-0368-5330; ISBN-963-371-677-2) Avail: NTIS (US Sales Only) HC A02/MF A01; DOE Depository Libraries

Numerical solutions are presented for the propagation of solar cosmic rays in interplanetary space, including the effects of pitch-angle scattering and adiabatic focusing. The intensity-time profiles can be well fitted by a simple radial spatial diffusion equation with scattering mean-free path lamb sub (fit). The radial mean-free path so obtained is significantly larger than the true scattering mean-free path for low-rigidity particles due to both adiabatic focusing and the inapplicability of the diffusive approximation early in the event. The well-known discrepancy between lambda sub (fit) and the theoretical predictions may be resolved by these calculations. DOE

99 GENERAL

N82-25092*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

THE TELECOMMUNICATIONS AND DATA ACQUISITION REPORT Progress Report, Jan. and Feb. 1982

N. A. Renzetti, ed. 15 Apr. 1982 194 p refs

(NASA-CR-168935; NAS 1.26:168935; TDA-PR-42-68) Avail: NTIS HC A09/MF A01 CSCL 22A

Developments in Earth-based radio technology are reported. The Deep Space Network is discussed in terms of its advanced systems, network and facility engineering and implementation, operations, and energy sources. Problems in pulse communication and radio frequency interference are addressed with emphasis on pulse position modulation and laser beam collimation. For individual titles, see N82-25093 through N82-25111.

N82-25093*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

DESCRIPTION OF THE DEEP SPACE NETWORK c14

N. A. Renzetti *In its* The Telecommun. and Data Acquisition Rept. 15 Apr. 1982 p 1-2 (For primary document see N82-25092 15-99)

Avail: NTIS HC A09/MF A01 CSCL 14B

The facilities, functions, and operations capabilities of the Deep Space Network are summarized. Network activities in support of planned future as well as ongoing deep space missions are described as are activities in support of radio astronomy experiments and the Astronomical Radio Interferometric Earth Surveying (ARIES) Network. Author

N82-25094*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

AN EFFICIENT SAMPLING TECHNIQUE FOR SUMS OF BANDPASS FUNCTIONS c32

W. M. Lawton *In its* The Telecommun. and Data Acquisition Rept. 15 Apr. 1982 p 3-7 refs (For primary document see N82-25092 15-99)

Avail: NTIS HC A09/MF A01 CSCL 20N

A well known sampling theorem states that a bandlimited function can be completely determined by its values at a uniformly placed set of points whose density is at least twice the highest frequency component of the function (Nyquist rate). A less familiar but important sampling theorem states that a bandlimited narrowband function can be completely determined by its values at a properly chosen, nonuniformly placed set of points whose density is at least twice the passband width. This allows for efficient digital demodulation of narrowband signals, which are common in sonar, radar and radio interferometry, without the side effect of signal group delay from an analog demodulator. This theorem was extended by developing a technique which allows a finite sum of bandlimited narrowband functions to be determined by its values at a properly chosen, nonuniformly placed set of points whose density can be made arbitrarily close to the sum of the passband widths. T.M.

N82-25095*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

AN EXPERIMENTAL INVESTIGATION OF THE CHANGES OF VLBI TIME DELAYS DUE TO ANTENNA STRUCTURAL DEFORMATIONS c32

T. Y. Otoshi and L. E. Young *In its* The Telecommun. and Data Acquisition Rept. 15 Apr. 1982 p 8-16 refs (For primary document see N82-25092 15-99)

Avail: NTIS HC A09/MF A01 CSCL 20N

Structural deformations primarily occur as functions of antenna elevation angle due to gravity loading. For a Cassegrain antenna, one of the major effects of structural deformation on measured VLBI time delays are those delay changes associated with axial subreflector displacement from its nominal position. Two types of time delay changes that occur when the subreflector is axially defocused are: a change which is a linear function of subreflector defocus position; and a cyclical change caused by multipath. Test results show that for the 64-m DSN antenna, the linear change is 1.8 times the subreflector defocus position, while the peak-to-peak change in cyclical variation is about + or - 3 cm when a spanned bandwidth of 38 MHz at 2290 MHz is used. T.M.

N82-25096*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

THE EFFECTS OF VITERBI DECODER NODE SYNCHRONIZATION LOSSES ON THE TELEMETRY RECEIVING SYSTEM c17

L. J. Deutsch and R. L. Miller *In its* The Telecommun. and Data Acquisition Rept. 15 Apr. 1982 p 17-24 refs (For primary document see N82-25092 15-99)

Avail: NTIS HC A09/MF A01 CSCL 09F

The Viterbi decoders currently used by the Deep space Network (DSN) use an algorithm for maintaining node synchronization that breaks down at bit signal-to-noise ratios (SNRs) of about 2.0 dB. It is shown that this can become an important consideration when the effects of noisy carrier referencing are combined with the lower SNRs that are expected at Voyager 2 Uranus and Neptune encounters. Depending on the available carrier power, node synchronization losses of between 0.85 and 1.25 dB can be expected in addition to the radio loss. T.M.

N82-25097*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

ELECTRONIC BEAM STEERING OF SEMICONDUCTOR INJECTION LASERS c36

J. Katz *In its* The Telecommun. and Data Acquisition Rept. 15 Apr. 1982 p 25-41 refs (For primary document see N82-25092 15-99)

Avail: NTIS HC A09/MF A01 CSCL 20E

A theoretical analysis of the problem of beam steering is presented. The required modifications of the dielectric constant profile of the laser structure were derived. A practical method for implementing the needed modifications is outlined. T.M.

N82-25098*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

PHASE CONTROL AND BEAM STEERING OF SEMICONDUCTOR LASER ARRAYS c36

J. Katz *In its* The Telecommun. and Data Acquisition Rept. 15 Apr. 1982 p 42-49 refs (For primary document see N82-25092 15-99)

Avail: NTIS HC A09/MF A01 CSCL 20E

The operational principles and a possible device configuration of one dimensional monolithically integrated semiconductor laser arrays are described. The output beam of the array can be electronically steered. Devices of the type can find applications in optical communication systems where the power levels needed are above the capability of a single laser device. T.M.

N82-25099*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

A PPM MODULATOR AND DEMODULATOR FOR THE 2.5 BIT/DETECTED PHOTON DEMONSTRATION c35

W. K. Marshall *In its* The Telecommun. and Data Acquisition Rept. 15 Apr. 1982 p 50-54 refs (For primary document see N82-25092 15-99)

Avail: NTIS HC A09/MF A01 CSCL 14B

In addition to performing the basic pulse position modulation and demodulation, the hardware described also indicates the occurrence of erasures and errors of various types. The analyzer

portion of the circuit counts the number of pulses received in a word, demodulates a second input pulse (if one is received), indicates the occurrence of erasures, and detects PPM word errors. Word errors are detected by comparing the modulator input word to the corresponding demodulator output. These functions are provided mainly for testing and diagnosis of the system during the feasibility demonstration period. T.M.

N82-25100*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

A STATISTICAL MODEL OF THE PHOTOMULTIPLIER GAIN PROCESS WITH APPLICATIONS TO OPTICAL PULSE DETECTION **c74**

H. H. Tan *In its* The Telecommun. and Data Acquisition Rept. 15 Apr. 1982 p 55-67 refs (For primary document see N82-25092 15-99)

Avail: NTIS HC A09/MF A01 CSCL 20F

A Markov diffusion model was used to determine an approximate probability density for the random gain. This approximate density preserves the correct second-order statistics and appears to be in reasonably good agreement with experimental data. The receiver operating curve for a pulse counter detector of PMT cathode emission events was analyzed using this density. The error performance of a simple binary direct detection optical communication system was also derived. T.M.

N82-25101*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

EVALUATION OF WAVEGUIDE COATING MATERIALS **c27**

W. C. J. Chen and B. W. Baker *In its* The Telecommun. and Data Acquisition Rept. 15 Apr. 1982 p 68-71 refs (For primary document see N82-25092 15-99)

Avail: NTIS HC A09/MF A01 CSCL 11G

Waveguide coating materials were tested at 8470 MHz for insertion loss. Samples of these coatings on waveguide pieces without flanges were tested in an environmental chamber to simulate the effects of high power microwave heating. Test results indicated that three types of coating materials are acceptable with regard to insertion loss. However, simulated microwave heating caused debonding of Metcot 7 and BD-991 coatings, resulting in peelings in the waveguide. The higher cost Chemglaze R104 does not exhibit this problem. T.M.

N82-25102*# University of Southern California, Los Angeles.

ERROR PROBABILITIES IN OPTICAL PPM RECEIVERS WITH GAUSSIAN MIXTURE DENSITIES **c74**

R. M. Gagliardi *In* JPL The Telecommun. and Data Acquisition Rept. 15 Apr. 1982 p 72-77 refs (For primary dccument see N82-25092 15-99)

Avail: NTIS HC A09/MF A01 CSCL 20F

A Gaussian mixture density arises when a discrete variable (e.g., a photodetector count variable) is added to a continuous Gaussian variable (e.g., thermal noise). Making use of some properties of photomultiplier Gaussian mixture distributions, some approximate error probability formulas can be derived. These appear as averages of M-ary orthogonal Gaussian error probabilities. The use of a pure Gaussian assumption is considered, and when properly defined, appears as an accurate upper bound to performance. T.M.

N82-25103*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

AN AUTOMATED FORTRAN DOCUMENTER **c61**

T. Erickson *In its* The Telecommun. and Data Acquisition Rept. 15 Apr. 1982 p 78-85 (For primary document see N82-25092 15-99)

Avail: NTIS HC A09/MF A01 CSCL 09B

A set of programs designed to help R&D programmers document their FORTRAN programs more effectively were written. The central program reads FORTRAN source code and asks the programmer questions about things it has not heard of before. It inserts the answers to these questions as comments into the FORTRAN code. The comments, as well as extensive cross-reference information, are also written to an unformatted file. Other programs read this file to produce printed information or to act as an interactive document. T.M.

N82-25104*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

NEW CCIR PAPERS ON TELECOMMUNICATIONS FOR DEEP SPACE RESEARCH **c32**

N. F. OldeGroot *In its* The Telecommun. and Data Acquisition Rept. 15 Apr. 1982 p 86-102 refs (For primary document see N82-25092 15-99)

Avail: NTIS HC A09/MF A01 CSCL 17B

The selection of preferred frequency bands for deep space telecommunications in the 20 to 120 GHz range is discussed. The performance of links between Earth stations and stations in deep space is affected by the atmosphere of the Earth. Attenuation and emission by the atmosphere generally limits deep space telecommunications to frequencies below 20 GHz. There are, however, certain frequency bands in the 20 to 120 GHz range where atmospheric attenuation is low enough to permit links between Earth stations and deep space stations. Additionally there are certain other bands in the 20 to 120 GHz range that would be particularly suitable for links between an Earth orbiting relay station and deep space stations. S.L.

N82-25105*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

DSN RFI SUSCEPTIBILITY MODELS DEVELOPMENT PROGRAM OVERVIEW **c32**

M. K. Sue *In its* The Telecommun. and Data Acquisition Rept. 15 Apr. 1982 p 103-109 refs (For primary document see N82-25092 15-99)

Avail: NTIS HC A09/MF A01 CSCL 20N

The RFI model development described intended to provide an understanding of the interference susceptibility of DSN receivers. An overview of interference types and effects, analytic modelling and experimental verification is presented. S.L.

N82-25106*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

RFI MEASUREMENT SURVEY AT GOLDSTONE IN NOVEMBER AND DECEMBER 1981 **c32**

R. M. Taylor *In its* The Telecommun. and Data Acquisition Rept. 15 Apr. 1982 p 110-121 (For primary document see N82-25092 15-99)

Avail: NTIS HC A09/MF A01 CSCL 20N

A measurement survey was conducted to measure the emissions from the transmitters at Deep Space Station 14 and the Spaceflight Tracking and Data Network station. Both intended and spurious emissions were measured from DSN operational transmitters. The quiescent electromagnetic environment was also measured. S.L.

N82-25107*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

OPERATIONS OF THE RECONFIGURED GROUND COMMUNICATIONS FACILITY CENTRAL COMMUNICATIONS TERMINAL AND THE NETWORK OPERATIONS CONTROL CENTER **c32**

J. C. Santana and L. E. Jennings *In its* The Telecommun. and Data Acquisition Rept. 15 Apr. 1982 p 122-129 refs (For primary document see N82-25092 15-99)

Avail: NTIS HC A09/MF A01 CSCL 17B

The ground communications facility (GCF) central communications terminal and network operations control center (NOCC) hardware was rearranged, supplemented, and modified, and software programs changed to provide an improved GCF and NOCC operational environment and capability. Control center operations section activities required to make the changeover from the old to the new GCF and NOCC configuration are addressed. S.L.

N82-25108*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.

MARK 4-A DSCC TELEMETRY SYSTEM DESCRIPTION **c17**

R. Burt *In its* The Telecommun. and Data Acquisition Rept. 15 Apr. 1982 p 130-138 refs (For primary document see N82-25092 15-99)

Avail: NTIS HC A09/MF A01 CSCL 06F

The DSN is undertaking a major modification of the Mark 3. The modified network described is the Mark 4-A. The DSCC

portion of the DSN telemetry system is changed in two major ways as a result of the Mark 4-A DSN implementation. Two 34 meter antennas are added to each deep space communications complex (DSCC). The arraying of those antennas with the existing 64 and 34 meter antennas will provide the equivalent of two separate 64 meter antennas or two 64 meter antennas arrayed together. To accomplish this, the DSCC is modified to provide baseband combining of three 34 meter antennas and one 64 meter antenna. The telemetry system is configured to support either two deep space missions and one highly elliptical orbiter or two highly elliptical orbiters and one deep space mission. Highly elliptical orbiter missions have data rates up to 202 ksps modulated directly on the carrier. S.L.

N82-25109*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
ANALYSIS OF DSN PPM SUPPORT DURING VOYAGER 2 SATURN ENCOUNTER c35
C. D. Bartok *In its* The Telecommun. and Data Acquisition Rept. 15 Apr. 1982 p 139-150 ref (For primary document see N82-25092 15-99)
Avail: NTIS HC A09/MF A01 CSCL 14B

The precision power monitor (PPM) is a precision radiometric instrument used to improve the efficiency of signal reception by the Deep Space Network. Real time estimates of the system operating temperature, the present (signal + noise)-to-noise ratio, and the signal power are utilized to increase the accuracy and resolution of the received spacecraft signal. Due to the critical nature of radio science data returning from Voyager 2 at Saturn Encounter, PPM support was required. The task was undertaken to validate the performance of equipment technically under research and development in time to meet the encounter deadline. Initial studies revealed PPM performance to be out of tolerance. Action was immediately taken to identify the system problems. Using data analysis as feedback, the system failures were identified and corrected in time to contribute to the encounter support efforts. As a result, the radio science data were collected successfully. S.L.

N82-25110*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
POTENTIAL REDUCTION OF DSN UPLINK ENERGY COST c33
S. Dolinsky and N. F. deGroot *In its* The Telecommun. and Data Acquisition Rept. 15 Apr. 1982 p 151-166 refs (For primary document see N82-25092 15-99)
Avail: NTIS HC A09/MF A01 CSCL 09C

DSN Earth stations typically transmit more power than that required to meet minimum specifications for uplink performance. Energy and cost savings that could result from matching the uplink power to the amount required for specified performance are studied. The Galileo mission was selected as a case study. Although substantial reduction in transmitted energy is possible, potential savings in source energy (oil or electricity) savings are much less. This is because of the rising inefficiency in power conversion and radio frequency power generation that accompanies reduced power output. S.L.

N82-25111*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
A SIMPLIFIED SOLAR CELL ARRAY MODELLING PROGRAM c44
R. D. Hughes *In its* The Telecommun. and Data Acquisition Rept. 15 Apr. 1982 p 167-185 refs (For primary document see N82-25092 15-99)
Avail: NTIS HC A09/MF A01 CSCL 10A

As part of the energy conversion/self sufficiency efforts of DSN engineering, it was necessary to have a simplified computer model of a solar photovoltaic (PV) system. This article describes the analysis and simplifications employed in the development of a PV cell array computer model. The analysis of the incident solar radiation, steady state cell temperature and the current-voltage characteristics of a cell array are discussed. A sample cell array was modelled and the results are presented. S.L.

N82-25112# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md. Chemical Propulsion Information Agency.
THE 1981 JANNAF PROPULSION MEETING, VOLUME 1
Karen L. Strange, ed. May 1981 625 p refs Conf. held in New Orleans, 26-28 May 1981 9 Vol.
(Contract N00024-81-C-5301)
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The fields of missile, space and gun propulsion were investigated. Areas of study include: propellant ingredient synthesis, solid propellants, gas generators, space transportation propulsion, nozzle performance, liquid propellants, MX components, holographic analysis, and nozzleless motors. For individual titles, see N82-25113 through N82-25148.

N82-25113 Thiokol Corp., Brigham City, Utah.
MX STAGE 1 c20
P. R. Dykstra *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 1 May 1981 p 1-12 (For primary document see N82-25112 15-99)
(Contract F04704-78-C-0009)
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The MX Stage 1 baseline design and planned development program is described. The progress through the first two developmental static tests is discussed. Data obtained to date from component testing and the static tests confirm that the baseline design is sound and conservative. B.W.

N82-25114 Thiokol Corp., Brigham City, Utah.
MX FIRST STAGE NOZZLE DEVELOPMENT c20
G. C. Lamere, A. R. Canfield, M. B. Kuwana, and A. L. Chambers *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 1 May 1981 p 13-28 (For primary document see N82-25112 15-99)
(Contract F04704-78-C-0009)
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The initial development testing of the MX first stage nozzle is discussed. A fixed nozzle was used for the initial test. The test was successful, and all objectives were met. The initial test has verified adequacy of the design and fabrication methods and no major problems are foreseen. The DM-6 nozzle will incorporate weight reductions which are evident from the post test analyses of the DM-1 thru DM-4 static tests. B.W.

N82-25115 SRI International Corp., Menlo Park, Calif.
A NEW POLYMERIZATION TECHNIQUE FOR PREPARING LOW MOLECULAR WEIGHT POLYETHER GLYCOLS c27
G. E. Manser, J. Guimont, and D. L. Ross *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 1 May 1981 p 29-37 refs (For primary document see N82-25112 15-99)
(Contract N00014-79-C-0525)
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It was demonstrated that exact and predetermined molecular weight polyols derived from the cationic polymerization of cyclic ethers can be obtained by using stoichiometric quantities of diol to monomer. The final molecular weight achieved is proportional to the stoichiometric addition of the molecular weights of the diol and cyclic ether. It was further demonstrated that liquid polyols are produced when a monomer that gives a crystalline homopolymer, is copolymerized with tetrahydrofuran. In both studies the polyols were found to have theoretical functionalities of 2 and minimal cyclic oligomer content. B.W.

N82-25116 Rocketdyne, Canoga Park, Calif.
SYNTHESIS OF ENERGETIC COMPOUNDS c25
M. B. Frankel, E. R. Wilson, D. O. Woolery, C. L. Hamermesh, and C. McArthur *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 1 May 1981 p 39-50 refs Prepared in cooperation with Rockwell International, Thousand Oaks, Calif. (For primary document see N82-25112 15-99)
(Contract N00014-79-C-0043)
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The synthesis and characterization of two energetic monomers, 2-azido-2,2-dinitropropyl glycidyl ether and 3,3-bis (azidomethyl) oxetane (BAMO) is described. Studies were carried out on the polymerization of the BAMO monomer. The reaction parameters that were examined included: (1) solvent system, (2) reaction stoichiometry, (3) type of chain terminator, (4) reaction time and (5) reaction temperature. BAMO was successfully polymerized to give hydroxy terminated prepolymers with weight average molecular weights in the 2000-3000 range and functionalities of 2.0 to 2.9. The prepolymers were solids, melting

point 75 to 78 C with a density of 1.30. Preliminary curing studies on these prepolymers gave tough cured gumstocks.
Author

N82-25117 Naval Weapons Center, China Lake, Calif. Research Dept.
KINETICS OF GAP POLYMERIZATION **c27**
M. P. Nadler, R. Reed, Jr., and J. Doyle *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 1 May 1981 p 51-61 refs (For primary document see N82-25112 15-99)
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Fourier transform infrared was used to study the polymerization of glycidyl azide polymer (GAP) (-OH terminated) to polyurethanes. Various disfunctional isocyanates and different catalysts were used with the main effort on the lysine diisocyanate methyl ester and ferric acetylacetonate (Fe(AA)3) system. The different GAP systems were compared using isocyanate disappearance times to 50% and 90% reaction and pseudo first order rate constants. The mechanisms of GAP polymerization are discussed that bring out the relative importance of alcohol catalyst versus isocyanate-catalyst intermediate species. Author

N82-25118 Bell Aerospace Co., Buffalo, N. Y. Propulsion and Energy Systems Dept.
THE EFFECTS OF LONG TERM SUBMARINE DEPLOYMENT ON SAFE STORAGE AND RELIABILITY OF LIQUID POST BOOST SYSTEMS **c28**
L. M. Usiak *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 1 May 1981 p 63-81 refs (For primary document see N82-25112 15-99)
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The issue of liquid propellant storability in post boost systems, when the latter are deployed in a submarine environment for a 20 year service period is discussed. Data include results of long term storage and post storage tests from the Minuteman III program, studies of potential safety of Minuteman liquid bipropellant systems in submarine applications, safety trails of submarine based liquid monopropellant systems, and long term propellant compatibility data. The data provide evidence that safe storage and reliability will not be compromised by deploying liquid systems in a submarine storage environment for long periods. B.W.

N82-25119 Bell Aerospace Co., Buffalo, N. Y. Textron Div.
TRANSIENT BEHAVIOR OF LIQUID IN AN AXIALLY VIBRATED TANK **c34**
Thomas M. Ferger *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 1 May 1981 p 83-96 refs (For primary document see N82-25112 15-99)
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Vibration tests along the principal axis of a propellant tank resulted in failure of an isolation shear disc under certain conditions of tank pressurization, indicating pressures much higher than could be expected from the imposed acceleration field. A mechanism was postulated in which the liquid in the tank was assumed to move as a series of infinitesimal concentric cylinders under the influence of the imposed oscillation field. In moving upward, the liquid compresses the pressurizing gas in the ullage cavity, which then acts as a nonlinear spring propelling the liquid downward into the shear disc at varying rates causing occasional high impact pressures. A computer program was written to solve the one dimensional equations describing liquid motion in the tank. Results showed a very high degree of correlation with test accelerometer traces over a large range of test pressures. A strong nonlinear relationship between tank pressure and impact pressure was predicted and observed. The problem was resolved by increasing tank pressure to a point sufficient to overcome the effective gravitational lead developed during vibration tests. Author

N82-25120 Bell Aerospace Co., Buffalo, N. Y. Textron Div.
MX STAGE 4 PROPELLANT STORAGE ASSEMBLY **c28**
A. J. Friona and R. Wood (Arde, Inc., Mahwah, N.J.) *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 1 May 1981 p 97-111 (For primary document see N82-25112 15-99)
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An advanced design propellant storage assembly (PSA) for the MX stage 4 propulsion system is discussed. Background history and development of the concept for an advanced positive expulsion, ring reinforced, stainless steel diaphragm is presented. Design, fabrication methods, and tests performed to date are described. The PSA is an all welded A286 stainless steel conospheroid shell with the diaphragm welded internally. The shell is spin formed from plate stock. The membrane thickness is achieved by chemical milling. The design features and the fabrication stages provide a reliable and highly efficient propellant storage assembly. M.G.

N82-25121 United Technologies Corp., Sunnyvale, Calif. Chemical Systems Div.
OPTICAL HOLOGRAPHIC STRUCTURAL ANALYSIS OF KEVLAR ROCKET MOTOR CASES **c35**
W. J. Harris *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 1 May 1981 p 113-149 (For primary document see N82-25112 15-99)
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The methodology of applying optical holography to evaluation of subscale Kevlar 49 composite pressure vessels is explored. The results and advantages of the holographic technique are discussed. The cases utilized were of similar design, but each had specific design features, the effects of which are reviewed. Burst testing results are presented in conjunction with the holographic fringe patterns obtained during progressive pressurization. Examples of quantitative data extracted by analysis of fringe fields are included. R.J.F.

N82-25122 Science Applications, Inc., Irvine, Calif.
INTEGRATED NONDESTRUCTIVE EVALUATION SYSTEM **c38**
J. J. Glatz and D. H. Epperson *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 1 May 1981 p 151-173 refs (For primary document see N82-25112 15-99)
(Contract F33615-78-C-5132)
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An integrated nondestructive evaluation system was developed for detection of flaws in 3rd stage MX rocket nozzle size hardware. The system consists of four inspection techniques, X-ray densitometry, through transmission ultrasonics, real time radiography, and video scanning (with enhancement) which are all controlled by a microcomputer. Information is presented on the preliminary studies, the selection of the techniques, the function of the individual techniques, calibration standards developed for the device, and the evaluation of the system using the calibration standards. R.J.F.

N82-25123 Acurex Corp., Mountain View, Calif. Aerotherm Div.
PARTICULATE IMPACT EROSION IN ENTRANCE-THROAT REGION OF SOLID ROCKET NOZZLES **c20**
Z. Chiba *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 1 May 1981 p 175-187 refs (For primary document see N82-25112 15-99)
(Contract F04611-79-C-0012)
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A prediction procedure was developed to calculate recession, including the effects of particulate erosion, in the subsonic and transonic regions of solid propellant rocket nozzles. The procedure includes an empirical model to predict particulate erosion effects and a flowfield code to predict particle impact conditions. The erosion model was developed on the basis of experiments conducted with molten aluminum and aluminum oxide particles impacting heated carbon samples. The model accounts for both mechanical mass removal and chemical reactions between the particles and the surface. The conditions and location of particles impacting the nozzle entrance and nosecap regions are obtained by a two-dimensional, two-phase flowfield code which extends over the full length of the chamber. The influence of chamber and grain geometries on the particle erosion is thus included in the procedure. R.J.F.

N82-25124 Vought Corp., Dallas, Tex.
SOLID ROCKET PROPULSION FOR HYPERVELOCITY MISSILES **c20**
L. D. Cardwell *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 1 May 1981 p 189-212 (For primary document see N82-25112 15-99)

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The past and current efforts to study small, hypervelocity, kinetic energy kill missiles, emphasizing the solid rocket propulsion system requirements are presented. Missile/mission design and performance goals were defined and used in trade studies to establish propulsion system design criteria. A 2-inch diameter unguided hypervelocity missile was developed and was flight tested. A guided version of this missile using the same motor is being developed. The motor development effort reviewed includes missile size/performance requirements, boost-coast versus boost-sustain, effects of chamber pressure and nozzle design, and motor design parameters. Results of the motor static tests and motor/missiles flight tests are also presented. R.J.F.

N82-25125 Purdue Univ., Lafayette, Ind. Dept. of Mechanical Engineering.

SCARFED NOZZLE FLOW FIELD COMPUTATIONS c20

J. Vadyak and J. D. Hoffman *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 1 May 1981 p 213-234 refs (For primary document see N82-25112 15-99)

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An analysis is presented for calculating the supersonic three-dimensional flow field in scarfed propulsive nozzles. The flow is computed using a second-order pentahedral bicharacteristic method. For cases in which the nozzle contour has a slope discontinuity which generates a flow compression and the discontinuity is contained in the axial station where scarfing begins, then the resulting three-dimensional shock wave system is computed using a discrete shock wave fitting procedure. The shock wave system is included in the computation until shock waves emanating from opposite sides of the nozzle approximately intersect. At this stage, the annular flow region downstream of the shock wave at this axial station is used as initial data or the remainder of the computation, and the solution is continued as far as this initial data allows. After the flow field is determined, the engine thrust and moment components are found by numerically integrating the nozzle wall pressure distribution. It is assumed in the analysis that the jet expands into a quiescent medium with no mixing. A production type computer program capable of predicting the flow field in a variety of axisymmetric scarfed nozzle configurations was developed. Computed solutions are presented to illustrate application of the analysis. R.J.F.

N82-25126 Vought Corp., Dallas, Tex.

IMPULSIVE CONTROL FOR HYPERVELOCITY MISSILES c15

R. W. Magness *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 1 May 1981 p 235-252 ref (For primary document see N82-25112 15-99)

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A hypervelocity agile interceptor/quickshot is being developed for defense of ballistic missile launch sites. A guidance and control system is required to achieve the missile guidance accuracy necessary for direct target impact. Attitude control systems evaluated for the agile interceptor included aerodynamic controls, thrust vector controls and impulsive motor controls. The solid squib impulsive control motion was selected because of high response rate, low weight and low volume. A baseline motor configuration was designed and a solid propellant squib was developed for use in the control system. Ballistic pendulum and bench tests were conducted with a test impulsive control motor to measure nominal performance, establish the standard deviation of performance, and define requirements to prevent sympathetic ignition. A dynamic control wind tunnel test was also conducted to determine the impulse augmentation due to the impulsive motor jet interaction with the missile boundary layer. The degree and direction of augmentation was measured for variations in Mach number and angle of attack. R.J.F.

N82-25127 Tally Industries, Inc., Mesa, Ariz.

STUDY OF METALLOCARBORANES AS COMBUSTION MODIFIERS c25

Indu B. Mishra and C. I. Merrill (AFRPL, Edwards AFB, Calif.) *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 1 May 1981 p 253-285 refs (For primary document see N82-25112 15-99)

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The synthesis and characterization of certain transition metal carbollides, and tests of their ballistic modifier characteristics in solid propellants were studied. It was found that of all pi-bonded metallocarbollides, those of iron worked the best. Copper carbollides generally interfere with some cure reactions. Nickel compounds slow poor burn enhancement. Iron carbollides have the most desirable burn rate enhancement characteristics and they interfere least with the cure reaction. R.J.F.

N82-25128 Hercules, Inc., Cumberland, Md. Ballistics Lab.

MECHANISM OF THERMAL STABILIZATION OF NITRATE ESTER PROPELLANTS c28

P. A. Silver, J. W. Morton, K. O. Hartman, and R. Baczuk *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 1 May 1981 p 287-306 ref (For primary document see N82-25112 15-99)

(Contract N00024-80-C-5322)

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Arylamine derivatives in which the structure was varied systematically were evaluated as nitrate ester stabilizers. The electronegativity, size and location of the substituents on the arylamine substrate were varied to delineate the stabilization mechanism. Three critical characteristics of the derivatives were determined: their nitrosation rates, their solubility in nitroglycerin (NG) and NG-poly(ethylene glycol) lacquer, and the stability of the N-nitrosated derivative. Finally, the gassing rates of lacquers containing all of these derivatives were measured. Competitive nitrosation rates between N-methyl-p-nitroaniline (MNA) and each candidate were determined at three temperatures. Comparative rates were determined and relative activation energies were approximated. All eight of the compounds tested were competitive and nitrosated faster than MNA. Two of the compounds were practically insoluble which rendered them ineffective as stabilizers. Differential scanning calorimetry suggested that two of the nitroso derivatives had borderline stability. Since all of the candidates showed high nitrosation rates, their effectiveness in stabilizing NG/PEG lacquer was determined by measuring gas generation rates. R.J.F.

N82-25129 Atlantic Research Corp., Gainesville, Va.

IMPROVED NOZZLELESS PERFORMANCE PROGRAM c20

Catherine M. Yezzi, M. K. King, I. M. Procinsky, and D. Coats (Software and Engineering Associates, Inc.) *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 1 May 1981 p 307-337 refs (For primary document see N82-25112 15-99)

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The development and demonstration of a practical and accurate computer model to predict the performance of solid propellant, nozzleless rocket motors is discussed. The goal is to produce an a-priori, internal ballistics model that is accurate to within plus or minus 5 percent for instantaneous thrust, pressure, and burn time, and to within plus or minus percent for total impulse and delivered specific impulse. Progress on models of phenomena crucial to the behavior of nozzleless rocket motors is discussed. These phenomena include erosive burning, grain deflection, combustion efficiency, internal ballistics, motor ignition, flame spreading, and flow field characterization. The impact of different variables on the formulated models are tested. The objective is to limit the complexity of the various submodels, where possible, in order to allow the final computer program to be as accurate and efficient as possible while maintaining practical, short run times. R.J.F.

N82-25130 Aerojet Tactical Systems, Sacramento, Calif.

CORROSION OF ROCKET NOZZLE METALLIC THROATS IN OXIDIZING PROPELLANT ENVIRONMENTS c20

R. Brogan *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 1 May 1981 p 339-352 refs (For primary document see N82-25112 15-99)

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The suitability of metallic nozzle throat materials for propellants requiring reduced smoke and/or low attenuation exhaust characteristics was evaluated. These propellants require reduced metal additive concentrations and, as a consequence, exhibit high oxidation potential for chemical corrosion. Tungsten, molybdenum and, tantalum materials were evaluated. Surface thermochemistry computer models were employed and ablation was quantitatively determined as a function of surface temperature,

chamber pressure, and propellant composition. The prominent reaction species were identified and diffusion versus kinetic limited reaction modeling was appraised. The surface thermochemistry results were combined with ablation and in-depth conduction models to arrive at erosion predictions under motor conditions. This permitted erosion comparisons with actual firing data and allowed for estimations of erosion threshold surface temperatures and burn duration limiting melting phenomena. Under conditions where erosion was a strong function of surface temperature, observed motor to motor reproducibility was appraised in view of potential processing variables including the contact thermal resistance with backup materials. M.G.

N82-25131 Naval Weapons Center, China Lake, Calif.
NAVAL HIGH PERFORMANCE OPTIONS **c20**
R. W. Feist *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 1 May 1981 p 353-356 (For primary document see N82-25112 15-99)
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The objectives of a program for the comprehensive evaluation of the performance gains available and the hazards involved in using class 1.1 propellants in surface launched systems are described. In the performance evaluation phase, performance differences in terms of missile performance parameters are generated. In the hazard evaluation phase risk differences are assessed. This information is then displayed in a manner to let each missile program manager make his/her own trade-off and result in an appropriate propellant decision. The performance evaluation phase approach is to quantify system gains available by identifying representative surface launched systems and their critical performance requirements. Then rocket motors are designed using both class 1.1 and 1.3 propellants to best meet those requirements, taking into consideration the desirable features and limitations of each. M.G.

N82-25132 Universal Propulsion Co., Phoenix, Ariz.
HIGH DENSITY IMPULSE PROPELLANTS **c28**
H. J. McSpadden *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 1 May 1981 p 357-374 refs (For primary document see N82-25112 15-99)
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The development and utilization of CTPB based high density-impulse propellants are discussed. The propellants deliver as much as 20 lb-sec per cubic inch compared to less than 11 lb-sec per cubic inch in some rockets when CTPB/AP propellants are used. They are well suited for use in volume limited systems, such as aircrew escape systems, and are qualified over temperatures as great as -54 to +93 C and have been tested at +129 C. The performance of several rocket motors which use high density-impulse propellants is discussed including the MARK 16 and UPCO 1001-series rocket catapult motors, the MARK 82/90 man-seat separator motor, the M119 tip-off compensating rocket motor, and the UPCO P/N 1033-8 HARPOON capsule nose removal motor. M.G.

N82-25133 Hercules, Inc., Cumberland, Md. Ballistics Lab.
HIGH PERFORMANCE NON-EMBRITTLING DOUBLE-BASE PROPELLANTS **c28**
K. O. Hartmen and P. A. Silver *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 1 May 1981 p 375-398 refs (For primary document see N82-25112 15-99)
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The adaptation of high performance nitrate ester plasticized propellants to Navy tactical applications is discussed. The approach was to use a mixed plasticizer (50/50 NG-BTTN) with polyethyleneglycol prepolymer as the basis of the non-embrittling binder. Such a plasticizer system was demonstrated not to embrittle, even after long term cycling between -54 C and -12 C in contact with nitroglycerin (NG) or butanetriol trinitrate (BTTN) seed crystals. Propellants with solids loadings in the 73 to 80 percent range were examined on the one-pound scale to define the performance-processability-mechanical property tradeoff. A 73 percent solids non-embrittling propellant was successfully developed. Results of 80 percent solids propellant work indicate that such propellants are feasible although further development is required. Aging properties and hazards are discussed. M.G.

N82-25134 United Technologies Corp., Sunnyvale, Calif. Chemical Systems Div.
SOME NEW ALIPHATIC POLYAZIDES DERIVED FROM PENTAERYTHRITOL **c28**
W. S. Anderson and H. J. Hyer *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 1 May 1981 p 387-398 refs (For primary document see N82-25112 15-99)
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The methods of preparation of pentaerythritol-derived azides, their physical properties, and their utilization are discussed. The tosylates of pentaerythritol, dipentaerythritol and ripentaerythritol were converted to the corresponding tetra-, hexa-, and octa-azides by treatment with sodium azide. Structure of these aliphatic azide products was determined by a combination of infrared spectroscopy, mass spectroscopy, nuclear magnetic resonance, and elemental analysis. Their large positive heats of formation, high thermal stabilities, low hydrolysis rates, low melting points and ease of their preparation may make these azides attractive as high energy plasticizers for oxygen-rich polymers. M.G.

N82-25135 Tally Industries, Inc., Mesa, Ariz.
DECOMPOSITION OF TETRAZOLES **c28**
Indu B. Mishra *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 1 May 1981 p 399-406 refs (For primary document see N82-25112 15-99)
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In order to determine the mechanism of cleavage of the 5-aminotetrazolate ion, both electron impact and chemi-ionization (EI and CI) mass spectra for Ca(CN5H2)2 were investigated. When this molecule decomposes, proton abstraction from the 5-aminotetrazolate ion occurs with the formation of 5-aminotetrazole, which subsequently forms HN3 and CN3H3. A considerable amount of amino-imino interconversion occurs and the guanyl azide fragments break down. Several mass fragments show ion-molecule recombinations. Nitrogen atom formation occurs under all conditions. The CI spectra of 5-aminotetrazole was also investigated. M.G.

N82-25136 Hercules, Inc., Magna, Utah.
XLDB BINDER CATALYSIS STUDIES **c28**
L. W. Haas and J. Sinclair (Thiokol Corp., Brigham City, Utah) *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 1 May 1981 p 407-428 refs (For primary document see N82-25112 15-99)
(Contract N00030-81-C-0081)
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The chemistry of triphenyl bismuth (TPB), a delayed action catalyst, as it relates to crosslinked double base propellant cure chemistry was investigated. The role of acidity, both acid strength (pKa) and acid concentration, was determined. The stability and reactivity of 'active' TPB derivatives with acids was established. The effect of water as a potential catalyst deactivator was studied. In addition to activation by acidity, TPB was also found to be activated by a hydroperoxide. Air oxidation of the polyethylene glycol adipate was a potential source of hydroperoxide. Using FTIR, the effect of propellant ingredients on the TPB-catalyzed isocyanate-alcohol reaction delay time and cure rate was determined. M.G.

N82-25137 Olin Corp., Marion, Ill. Technical Systems Operation Dept.
LOW ENERGY PROPELLANT DEVELOPMENT **c28**
I. L. Markovitch and Melanie A. Krason *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 1 May 1981 p 429-445 (For primary document see N82-25112 15-99)
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The evaluation and selection of a binder system which would permit the maximum solids loading with good rheological properties for processing and yield a cured system which would have acceptable physical properties over a 219.3 K to 344.3 K temperature range is discussed. A castable composition was formulated at the 80 percent solids level with rheological characteristics which lends itself to manufacturing by modern solid propellant techniques. Physical properties were obtained which are considered to be excellent. Values in excess of 689.5 kPa stress and 20 percent strain at maximum stress are typical. Oxidizers which would be compatible with the binder system, contribute maximum oxygen to the formulation, permit

acceptable temperature cycling and long term aging, and possess good ballistic characteristics were evaluated. Propellant compositions yielding low noxious levels of gases, substantially free of solids and noncorrosive gases, and possessing flame temperatures in the range of 1255.4 K to 1644.3 K were also desired. Propellants containing ammonium nitrate were formulated with a nominal theoretical flame temperature of 1310.9 K. The formulations yielded less than 2.5 percent volumetric growth after being subjected to 150 temperature cycles. Nominal burning rates of 0.13 cm/sec to 0.24 cm/sec at 689.5 N/cu cm with temperature sensitivities of 0.42 percent deg to 0.58 K were obtained. M.G.

N82-25138 Naval Ordnance Station, Indian Head, Md.
A LOW RATE CTBN PROPELLANT **c28**
P. P. Ostrowski, C. Gotzmer, and L. K. Asaoka *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 1 May 1981 p 447-461 refs Prepared in cooperation with Naval Surface Weapons Center, White Oak, Md. (For primary document see N82-25112 15-99)
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A very low burn rate composite solid propellant utilizing a carboxy-terminated polybutadiene acrylonitrile (CTBN) liquid copolymer binder was demonstrated. The objective was to develop a propellant for starter cartridge applications. A low acrylonitrile CTBN binder with a dual epoxide crosslinking system was selected for its superior aging characteristics and processing properties compared to more conventional binder materials. Ballistic evaluation was performed in modified MK 6 gas generator hardware using a cast, cylindrical, single-perforated propellant grain in both an end-inhibited and an outside diameter-inhibited configuration. A formulation of 50 percent bimodal ammonium perchlorate, 30 percent CTBN binder and 20 percent high bulk density nitroguanidine successfully met the program objective by achieving a burn rate of 1.70 mm/sec at the required pressure with temperature conditioning to 25 C. In the pressure range of interest, 3.45 to 6.89 MPa (500 to 1000 psi), a temperature sensitivity pi sub k = 0.36 percent C was measured for temperatures between -54 C and 74. Initial mechanical and physical properties tests indicate acceptable performance levels for this type of grain design and operating conditions. M.G.

N82-25139 Atlantic Research Corp., Gainesville, Va.
DESIRABILITY ANALYSIS: A TECHNIQUE FOR GAS GENERANT SCREENING **c28**
Phillip H. Graham *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 1 May 1981 p 463-471 refs (For primary document see N82-25112 15-99)
(Contract N00123-77-C-1707)
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A mathematical technique for identifying optimum gas generant formulations is described. Simultaneous consideration of the variety of properties controlled by formulation, and identification of the range of compositions possessing the required combination of properties for a given end use is possible. Applications of the desirability analysis technique are demonstrated. J.D.

N82-25140 Martin Marietta Aerospace, Denver, Colo.
MX LAUNCHER INTEGRAL GAS GENERATOR CONCEPT (1) **c20**
J. A. McKinnis and A. R. OConnell *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 1 May 1981 p 473-490 (For primary document see N82-25112 15-99)
(Contracts F04704-78-)C-0016; F04704-80-C-0044)
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Internally mounted solid propellant gas generators for powering pneumatic actuators on the MX missile launcher are described. The designs of three integral gas generators utilizing the same propellant inhibitor, grain, seals, mounting, and ignition technique are described in detail. The erection generator for elevating the canister and missile to the launch position, the center strut generator which provides power to the actuator that fully deploys the center strut roller assembly, and the roof reaction generator which provides power to the actuator that deploys the roof reaction roller assembly are considered. The actuator walls serve as gas generator cases, the gas generator being a simple grain assembly that is cartridge loaded into the ends of the actuator. A cost summary is presented. J.D.

N82-25141 Tally Industries, Inc., Mesa, Ariz.
DEMONSTRATION OF A LONG BURN GAS GENERATOR **c20**
G. B. Pogue and R. E. Scott *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 1 May 1981 p 491-498 (For primary document see N82-25112 15-99)
Copyright. Avail: NTIS HC $60.50/MF $60.50 CSCL 21/8

A prototype solid propellant gas generator exhibiting burn times in excess of 1000 seconds within a 63.5 cm length grain envelope was successfully demonstrated. Burn times of 1502 seconds at -18 C and 1067 seconds at 49 C were achieved. The propellant, a recently developed carboxy terminated polyester/ammonium nitrate formulation (TAL-811), exhibited a burning rate of 0.066 cm/sec at 6.89 MPa and a theoretical flame temperature of approximately 815 C. The end burning propellant grain, insulated with a filled EPDM rubber sleeve and installed within an insulated steel case, minimized external case temperature rise during test duration. Test results exhibited a unique ballistic fluctuation phenomenon. Post program static firing computer analysis concluded that this phenomenon most probably was caused by unsteady heat feedback into the grain associated with breakup of an ash cinder. Author

N82-25142* Aerojet Liquid Rocket Co., Sacramento, Calif.
ADVANCED OXYGEN-HYDROCARBON EARTH-TO-ORBIT PROPULSION **c20**
C. J. O'Brien *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 1 May 1981 p 499-514 refs (For primary document see N82-25112 15-99)
(Contract NAS8-33452)
Copyright. Avail: NTIS HC $60.50/MF $60.50 CSCL 21H

Liquid oxygen/hydrocarbon (LO2/HC) rocket engine cycles for a surface to orbit transportation system were evaluated. A consistent engine system data base is established for defining advantages and disadvantages, system performance and operating limits, engine parametric data, and technology requirements for candidate engine systems. Preliminary comparisons of the engine cycles utilizing delivered specific impulse values are presented. Methane and propane staged combustion cycles are the highest LO2/HC performers. The hydrogen cooled LO2/methane dual throat engine was found to be the highest performing. Technology needs identified in the study include: high temperature turbines; oxidizer-rich preburners; LO2, methane, and propane cooling; methane and propane fuel-rich preburners; the HC fuel turbopump; and application of advanced composite materials to the engine system. Parametric sensitivity analysis data are displayed which show the effect of variations in engine thrust, mixture ratio, chamber pressure, area ratio, cycle life, and turbine inlet temperature on specific impulse and engine weight. J.D.

N82-25143* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SPACE SHUTTLE PROPULSION PERFORMANCE IMPROVEMENT OPTIONS **c16**
D. L. Blackwell *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 1 May 1981 p 515-526 ref (For primary document see N82-25112 15-99)
Copyright. Avail: NTIS HC $60.50/MF $60.50 CSCL 22B

Various lift capability improvement options evaluated in order to identify the best single option or combination of options are described. The basic space shuttle vehicle consists of the orbiter, external tank, two solid rocket boosters, and a connecting system of attach hardware. A group of potential options analyzed by NASA since 1978 are described with respect to the shuttle lift capability and maintenance of satisfactory element and attach load margins. The propulsion performance improvement options under current study by NASA are identified and described. J.D.

N82-25144* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SPACE SHUTTLE SRM PERFORMANCE IMPROVEMENT **c20**
C. A. Speak, R. K. Wilks, and K. W. Jones *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 1 May 1981 p 527-542

Prepared in cooperation with Thiokol Corp., Brigham City, Utah (For primary document see N82-25112 15-99)
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An evaluation of performance improvements in the space shuttle solid rocket motors (SRMs) in order to increase payload capability for shuttle launches from both the Eastern Test Range (ETR) and the Western Test Range (WTR) are described. A number of SRM performance improvement options were studied and evaluated in respect to payload improvement potential, technical risk, schedule, cost, and impact on shuttle system performance. Changes providing an approximate 3000 pound payload gain with a minor loads impact on the shuttle system are identified. Longer range options evaluated for the mission 4 WTR requirements were the use of a filament wound case, use of hydroxy terminated polybutadiene (HTPB) propellant, and further increases in the nozzle expansion ratio. The filament wound chamber option offers the largest and most attractive increased payload potential. Substitution of HTPB propellant provides a payload growth option if dictated by future mission requirements. J.D.

N82-25145 McDonnell-Douglas Astronautics Co., St. Louis, Mo.
DESIGN OF THE (STS) AFT PROPULSION SUBSYSTEM FOR LONG LIFE **c20**
Thomas F. Schweickert *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 1 May 1981 p 543-553 ref (For primary document see N82-25112 15-99)
Copyright. Avail: NTIS HC $60.50/MF $60.50 CSCL 21/8

Primary design considerations for the shuttle aft propulsion subsystem (APS) resulting from reuse requirements are described. The APS utilizes hypergolic bipropellants, nitrogen tetroxide and monomethyl hydrazine, to provide propulsive thrust for shuttle orbit insertion, on-orbit maneuvers, on-orbit attitude control, and reentry control and stabilization. J.D.

N82-25146* National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.
SUMMARY OF PRELIMINARY RESULTS FROM THE ENVIRONMENTAL MONITORING PROGRAM FOR STS-1 LAUNCH **c45**
A. M. Koller, Jr. and W. M. Knott, III *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 1 May 1981 p 555-586 refs (For primary document see N82-25112 15-99)
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An overview of the environmental program conducted at the John F. Kennedy Space Center, Florida is provided. Preliminary results of monitoring activities which were accomplished for flight readiness firing and the STS-1 launch are presented. J.D.

N82-25147 McDonnell-Douglas Astronautics Co., Huntington Beach, Calif.
PAYLOAD ASSIST MODULE NUTATION CONTROL SYSTEM **c20**
B. T. Schoonover, J. F. Willacker, and W. W. Wilson (Rocket Research Co., Redmond, Wash.) *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 1 May 1981 p 587-606 (For primary document see N82-25112 15-99)
Copyright. Avail: NTIS HC $60.50/MF $60.50 CSCL 21/8

The system description and a discussion of problems encountered in thruster and component qualification are presented. The payload assist module for Atlas class spacecraft (PAM-A) which is to be launched from the Space Transportation System (STS) is spin stabilized and requires damping of nutation created by energy dissipation including sloshing of onboard liquids. This function is performed by a nutation control system (NCS) employing a hydrazine thruster module, propellant tank, and control/monitor devices. Two fully redundant systems are provided on PAM-A and both can be utilized simultaneously (if both are activated) to reduce the damping time by approximately 50%. The 8 lb sub f thruster in each redundant system is fed by a prepressurized propellant tank containing 6.35 lb sub m of hydrazine with tank pressure blowing down over the mission. The thruster is required to operate at impulse bits as small as .07 lb sub f sec while spinning at 55 rpm and in the steady state mode during a depletion burn. J.D.

N82-25148 Boeing Aerospace Co., Seattle, Wash.
HYDRAZINE PRESSURE SURGES INTO AN EVACUATED MANIFOLD ASSEMBLY **c20**
Philip J. Knowles *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 1 May 1981 p 607-627 refs (For primary document see N82-25112 15-99)
(Contract F04701-78-C-0040)
Copyright. Avail: NTIS HC $60.50/MF $60.50 CSCL 21/8

A test series to measure hydrazine water hammer surges for the inertial upper stage (IUS) reaction control subsystem (RCS) is described. The series of fluid surges were compared with theory and provide insight into the eventual IUS flight conditions. The test activity included water and hydrazine surges, solenoid and squib valve operation, one and two tank surge configurations, and up to a dozen surge measurement locations. All surges were demonstrated in tightly evacuated manifold conditions of 0.1 psi or less. Hydrazine pressure surges of up to 7,200 psi with 0.4 ms duration were measured. All measurements fell within 40 to 85% of theory. Of the methods available to suppress the surge, a GH2 prepressure cushion was preferred. J.D.

N82-25149# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md. Chemical Propulsion Information Agency.
THE 1981 JANNAF PROPULSION MEETING, VOLUME 2
Karen L. Strange, ed. May 1981 631 p refs Meeting held in New Orelans, 26-28 May 1981 2 Vol.
(Contract N00024-81-C-5301)
(AD-A103845; CPIA-Pub-340-Vol-2) Copyright. Avail: NTIS HC $60.50/MF $60.50 CSCL 21/8

Significant developments and current investigations under government and independently funded programs are reported in the areas of solid, liquid, ramjet, and gun propulsion systems. For individual titles, see N82-25150 through N82-25169.

N82-25150# Boeing Aerospace Co., Seattle, Wash.
DEMONSTRATION OF A SIMPLE DEVICE TO START AN OVERCONTRACTED MIXED COMPRESSION INLET **c20**
B. M. Dunn and L. E. Fink *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 2 May 1981 p 1-19 refs (For primary document see N82-25149 15-99)
Avail: NTIS HC $60.50/MF $60.50 CSCL 21/8

A simple concept which also serves as a non-ejectable inlet cover was conceived (and patent applied for) that allows starting of an overcontracted mixed compression inlet. Two-dimensional, inviscid internal flow analyses of this concept indicate its workability. A small scale inlet model was designed and fabricated, and the feasibility of this concept was demonstrated during a series of IR&D funded wind tunnel tests performed at Mach = 3.0 and 2.73. Other major test variables were boundary layer bleed flow amount and location, and cowl lip geometry. The design analysis, test results, and the impact of the concept on mission performance of a typical air-to-air missile are discussed. A.R.H.

N82-25151# Atlantic Research Corp., Gainesville, Va.
TRANSITION STUDIES FOR A SOLID FUEL INTEGRAL ROCKET RAMJET **c20**
P. S. Kunkel and C. R. Limage *In* APL The 1980 JANNAF Propulsion Meeting, Vol. 2 May 1981 p 21-32 (For primary document see N82-25149 15-99)
Avail: NTIS HC $60.50/MF $60.50 CSCL 21/8

Major design variables were isolated and their individual sensitivities to the overall transition event were determined during investigations in a direct-connect air-flow test facility. The test model was a 3 inch I.D. combustor/booster section connected to a sustainer gas generator. Between the combustor and the gas generator, an inlet section was provided representing a single side dump configuration. The inlet port cover was simulated by a pyrotechnic actuated valve with a response time of less than 10 m secs. Data were obtained over a wide range of sequencing between booster burn out, initiation of inlet air flow, and sustainer ignition. High response dynamic pressure and temperature instrumentation were used to evaluate conditions in the combustor and inlet duct during each test firing. Analysis of the test results shows the effects of port cover time delays on ramjet ignition and determination of the minimum delay time required for successful transition. A.R.H.

N82-25152# Georgia Inst. of Tech., Atlanta. Dept. of Aerospace Engineering.

MEASUREMENTS OF TURBULENT MIXING IN THE NEAR WAKE OF A CIRCULAR CYLINDER BY PHOTON CORRELATION LASER VELOCIMETRY **c02**

R. E. Walterick, G. D. Catalano (Louisiana State Univ., Baton Rouge), and H. E. Wright (Air Force Inst. of Technology) *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 2 May 1981 p 33-48 refs (For primary document see N82-25149 15-99)
Avail: NTIS HC $60.50/MF $60.50 CSCL 01A

The near field region of the turbulent wake behind a stationary (omega = 0 RPM) and rotating (omega = 500 RPM) two dimensional circular cylinder is documented. U component mean velocities, turbulent intensities and velocity autocorrelation functions are measured at various downstream locations. From the autocorrelation functions, Taylor time microscales, which are a characteristic time scale for the turbulence, are computed. The free stream velocity and Reynolds number, based on cylinder diameter are respectively 5.9 m/sec and approximately 50,000. The free stream turbulence is approximately 10 percent. The turbulent measurements were made with a laser velocimeter using a frequency shifting phase modulator and the photon correlation processing scheme. Naturally occuring contaminant was augmented with vaporized kerosene to increase the magnitude of scattered light. Results are presented for the effects of varying angular speed, and thus a large scale initial condition on the turbulent quantities. Author

N82-25153*# Louisiana State Univ. and A&M Coll., Baton Rouge. Dept. of Mechanical Engineering.
THE DEFLECTION OF A JET BY CONFINING SURFACES **c34**

G. D. Catalano, J. B. Morton, and R. R. Humphris *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 2 May 1981 p 49-66 refs Sponsored in part by NSF Prepared in cooperation with Virginia Univ., Charlottesville (For primary document see N82-25149 15-99)
(Grant NGR-47-005-219)
Avail: NTIS HC $60.50/MF $60.50 CSCL 20D

Thrust vectoring can be provided by the turning of a jet exhaust by the presence of confining surfaces. This approach is analogous to the upper surface blowing (USB) concept. Mean velocities, velocity autocorrelations, and pressure-velocity correlations are measured. From the autocorrelation curves, the Taylor microscales and the integral length scales are calculated. Convection velocities are calculated from the velocity space-time correlations. Two different confining surfaces (one flat, one with large curvature) are placed adjacent to the lip of a circular nozzle, and the resultant effects on the flow field are determined. In addition, two velocity ratios (exit plane velocity to ambient stream velocity) are examined. The velocity measurements were made with a laser Doppler velocimeter in conjunction with a phase locked-loop processor. Pressure measurements were made using a 1/8th inch condensor type microphone. Author

N82-25154# Applied Physics Lab., Johns Hopkins Univ., Laurel, Md.
INSTRUMENTATION FOR SUPERSONIC COMBUSTION RESEARCH **c07**

F. S. Billig, R. E. Lee, and P. J. Waltrup *In its* The 1981 JANNAF Propulsion Meeting, Vol. 2 May 1981 p 67-99 refs (For primary document see N82-25149 15-99)
(Contract N00024-78-C-5384)
Avail: NTIS HC $60.50/MF $60.50 CSCL 21/5

Techniques for determining the physical properties of the exit flows from fuel-rich ramjet combustors and the flows in and from supersonic combustors are discussed. Several nonintrusive optical techniques for measuring particle sizes were examined to determine the more suitable techniques to resolve particle sizes in the range of 0.5 micrometers to 50 micrometers. Measurements of particle velocity and size with a laser Doppler velocimeter and particle sizing interferometer are presented and are complemented by analyses of particles and gas phase constituents extracted from the reacting supersonic flow with scavening probes. The range of particle sizes determined by the two techniques is in good agreement. The measured particle velocities correspond to computed velocities of very small particles that do not have significant lag. Author

N82-25155# Naval Weapons Center, China Lake, Calif.
WATER TUNNEL AND WINDOWED COMBUSTION AS TOOLS FOR DUCTED ROCKET DEVELOPMENT **c20**

K. C. Schadow and D. J. Chieze *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 2 May 1981 p 101-115 refs (For primary document see N82-25149 15-99)
Avail: NTIS HC $60.50/MF $60.50 CSCL 21/8

Windowed combustor and water tunnel tests to study the effect of inlet and combustor parameters on mixing/combustion and overall performance for solid propellant gas generator ramjets (ducted rockets) with two opposing side air inlets are described. From the water flow (mixing) and flame characteristics qualitative insight was gained into the effect of air inlet momentum, fuel injection momentum, and air inlet angle on combustion efficiency. Author

N82-25156# Atlantic Research Corp., Gainesville, Va.
SIMULATION OF THE INTEGRAL ROCKET RAMJET FLIGHT REGIME IN A GROUND-BASED TEST FACILITY **c20**

B. J. Brien *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 2 May 1981 p 117-140 (For primary document see N82-25149 15-99)
Avail: NTIS HC $60.50/MF $60.50 CSCL 21/8

The Atlantic Research Corporation test facility for simulating the flight environments encountered by integral rocket-ramjet systems, ducted rockets, and solid fuel ramjets is described. This facility provides full transition testing, trajectory simulation, altitude simulation, ramjet thrust measurement, free jet testing, low test costs, and high hazard test capability. The test facility operational parameters, components, and control logic are presented. J.D.

N82-25157# Marquardt Corp., Van Nuys, Calif.
HYDRAZINE SPACE HAZARD INVESTIGATION **c28**

D. G. Phillips *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 2 May 1981 p 141-157 Sponsored by RCA (For primary document see N82-25149 15-99)
Avail: NTIS HC $60.50/MF $60.50 CSCL 20/9

Experimental tests to determine if liquid hydrazine would rapidly decompose or burn when injected onto a hot metal surface under simulated space conditions are described. Testing was done in an 89 cu ft vacuum chamber which was evacuated to an initial pressure of 4-8 microns. For each test, about six millimeters of hydrazine was injected onto a four inch plate that was heated to temperatures up to 1700 F. The final chamber pressure and the plate temperature were measured along with other parameters. Test results showed the following: (1) ambient temperature hydrazine will partially vaporize and freeze when it is injected into a space pressure environment and form a semisolid with 2 snow like appearance, (2) hydrazine sprayed onto a hot metal plate will locally reduce the metal plate temperature, and (3) the final test cell chamber pressure correspond to only that of vaporized hydrazine and not that of decomposed hydrazine. From these results, it is concluded that hydrazine will not rapidly decompose or burn if injected onto a hot metal surface under space conditions. Author

N82-25158* Jet Propulsion Lab., California Inst. of Tech., Pasadena.
PLANETARY PUMP FED PROPULSION SYSTEM ENGINEERING MODEL TEST RESULTS **c20**

M. P. Zydowicz, L. K. Jones, and P. N. Estey *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 2 May 1981 p 159-175 refs (For primary document see N82-25149 15-99)
(Contract NAS7-100)
Avail: NTIS HC $60.50/MF $60.50 CSCL 21H

The rocket engines, a 2670 N radiation cooled assembly with a nominal chamber pressure of 1379 kPa and a 4430 N regeneratively cooled engine, nominal chamber pressure 2468 kPa were tested using pressure fed and pump fed nitrogen tetroxide and monomethylhydrazine. Engine firings were conducted over the range of 2224 to 3336 N and 3781 to 4450 N respectively. Mixture ratios were varied from 1.40 to 1.85. Test durations ranged between 5 and 200 seconds to establish performance and thermal stability characteristics. The radially bladed centrifugal pumps driven by independent gas turbines were used to supply pump fed propellants. Results from the fire tests with pump fed propellants are compared with data from pressure fed tests. Performance, thermal stability, and starting transients were

characterized. No significant differences were found between pump fed and pressure fed operation. J.D.

N82-25159*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
A PUMP FED PROPULSION SYSTEM FOR EARTH ORBITING SATELLITES c20
Paul N. Estey *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 2 May 1981 p 177-189 refs (For primary document see N82-25149 15-99)
(Contract NAS7-100)
Avail: NTIS HC $60.50/MF $60.50 CSCL 21H

A low thrust N2O4/monomethylhydrazine pump-fed propulsion system for use as a kick stage on Earth orbiting satellites is proposed. Such a system would incorporate many components currently under development at JPL for an interplanetary propulsion system. The heart of the system consists of a single whaft, dual pump, driven by an electric motor which is powered by a chemical battery having a high energy density. The major advantage of the pump-fed system over an equivalent pressure-fed system is that it delivers more payload to the required orbit. The system and mission parameters are presented as well as a pump-fed system design and the equivalent pressure-fed system design. The linear mass scaling equations which are applicable to the range of propellant loads required are developed. Several curves are presented to show the mass advantage of the pump-fed system over the pressure-fed system for the missions considered. J.D.

N82-25160# Martin Marietta Aerospace, Denver, Colo.
A MULTIMISSION TANK FOR NEXT GENERATION SPACECRAFT c18
D. A. Fester and R. N. Eberhardt *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 2 May 1981 p 191-214 refs (For primary document see N82-25149 15-99)
Copyright. Avail: NTIS HC $60.50/MF $60.50 CSCL 22/2

A spacecraft tank for monopropellant and bipropellant propulsion for orbit transfer and attitude control of next generation spacecraft is described. Applications include communications, Earth resources, servicing and resupply, meteorology, and defense satellites. The multimission tank baselined for these applications is a modified Viking Orbiter (VO-75) cylindrical vessel, 91 centimeters (36 inches) in diameter with hemispherical domes, which can accommodate either shuttle or expendable booster launch. Different passive, all metal propellant management devices are available to meet a wide range of mission requirements for acceleration, flowrate, pressure level, type of pressurization, and on orbit slosh control. The operation of each device is described along with its versatility and limitations. Tank system parameters of volume, weight, expulsion efficiency, volumetric efficiency, and relative cost are summarized. J.D.

N82-25161# Marquardt Corp., Van Nuys, Calif.
INSAT-1 SATELLITE PROPULSION SUBSYSTEM DESIGN AND TEST c20
R. C. Stechman and C. K. Drenning *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 2 May 1981 p 215-229 (For primary document see N82-25149 15-99)
Avail: NTIS HC $60.50/MF $60.50 CSCL 21H

The subsystem is a bipropellant system designed for a seven to ten year life in Earth orbit. This system, which provides propellant for 490N (110 lbf) and 22N (5 lbf) bipropellant rocket engines, incorporates technology which was developed during the Apollo and Shuttle eras. Propellant management devices in the titanium tanks are used to ensure gas free propellant and the all welded system provides for maintenance of system integrity over the mission duration. The design of the system, as well as the results of qualification and system test programs which were used to demonstrate the capability of the system as well as to determine the operating characteristics other various system imposed parameters, are presented. T.M.

N82-25162*# Jet Propulsion Lab., California Inst. of Tech., Pasadena.
PULSED PLASMA THRUSTER IGNITION STUDY c20
G. Aston and L. C. Pless *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 2 May 1981 p 231-244 refs (For primary document see N82-25149 15-99)
(Contracts F04611-78-X-0034; F04611-80-X-0041)
Avail: NTIS HC $60.50/MF $60.50 CSCL 21/3

Successful quantitative measurements of a one millipound pulsed plasma thruster plume backflow experiment are summarized. These measurements show plume backflow to be no more than other electric thruster concepts of a similar thrust level. The results of an ongoing one millipound pulsed plasma thruster ignition system study are also presented. Results show that inductively coupling the ignitor plug to the thruster cathode electrode and using a high current, short pulse length trigger circuit to fire this plug, keeps the plug face free from a life limiting carbonaceous deposit build up. T.M.

N82-25163# TRW Defense and Space Systems Group, Redondo Beach, Calif.
MISSION INTEGRATION STUDY FOR SOLID TEFLON PULSED PLASMA MILLIPOUND PROPULSION SYSTEM c20
Marshall Huberman, Sidney Zafran, M. Henry Gran, and J. M. Sellen *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 2 May 1981 p 245-263 refs (For primary document see N82-25149 15-99)
(Contract F04611-78-C-0064)
Avail: NTIS HC $60.50/MF $60.50 CSCL 21/8

Advantages to the Air Force of using high performance, pulsed plasma electric propulsion technology for satellite stationkeeping, attitude control, drag make up and solar pressure compensation are assessed. Pulsed plasma propulsion system/spacecraft integration and design criteria were developed. The application of pulsed plasma propulsion to specific Air Force missions, the Defense Satellite Communications Systems III (DSCS-III) and the Global Positioning System (GPS) were studied in detail. It is found that: there are no fundamental obstacles to the use of pulsed plasma propulsion for Air Force missions; pulsed plasma propulsion provides maximum benefits for functions which require either low impulse bit pulsing or long duration, high total impulse thrusting; and significant weight savings can be attained relative to hydrazine for DSCS-III. T.M.

N82-25164# Air Force Rocket Propulsion Lab., Edwards AFB, Calif.
THE PLACE OF SOLAR THERMAL ROCKETS IN SPACE c20
C. C. Selph *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 2 May 1981 p 265-288 refs (For primary document see N82-25149 15-99)
Avail: NTIS HC $60.50/MF $60.50 CSCL 21/8

The harnessing of sunlight for propulsive energy is a recurring theme in space propulsion, particularly for applications requiring large velocity increments, such as planetary exploration or comet rendezvous. Characteristically, it is viewed in terms of the solar sail and the solar cell; but for operations in Earth orbit these approaches are less desirable because the very low thrust leads to undesirably long maneuver times. Thrust levels several orders of magnitude higher are available with solar thermal rockets, while preserving a specific impulse advantage over chemical systems. The performance advantages, penalties, technological problems, and approaches were examined for solar thermal rockets. Its suitability in several Earth orbit missions is assessed. The peculiarities of vehicle design, the nature of the thruster and the solar concentrator are presented, and AF plans to implement the development of solar rockets are outlined. Author

N82-25165# TRW Systems Group, Redondo Beach, Calif.
EXPERIMENTAL DATA FOR A ONE METER DIAMETER PULSED INDUCTIVE PLASMA THRUSTER WITH APPLICATION TO A 25 KW MISSION c20
C. L. Dailey and R. H. Lovberg (California Univ., La Jolla) *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 2 May 1981 p 289-307 refs (For primary document see N82-25149 15-99)
Avail: NTIS HC $60.50/MF $60.50 CSCL 21/8

The thruster uses a flat spiral coil through which current is pulsed by discharging a 4k Joule capacitor using a spark gap switch. Argon propellant is injected in a thin layer over the coil prior to the capacitor discharge. Impulse is delivered to the gas during three half-cycles of the ringing discharge. Efficiency measurements show 42% to 1540 seconds I sub sp, 50% at 2240 seconds I sub sp and 55% at 3500 seconds I sub sp. A

conceptual design of a 25 kW plasma thruster module operating at 3000 seconds I sub sp is described for a long duration, large total impulse mission requiring 2100 Kg of argon propellant. The estimated specific mass for the module (dry and without solar power) is 15.6 Kg/kW. T.M.

N82-25166# Air Force Rocket Propulsion Lab., Edwards AFB, Calif.

AN ADVANCED HIGH ENERGY DENSITY CAPACITOR EVALUATION SYSTEM **c20**

T. Becker and J. R. Freeman *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 2 May 1981 p 309-323 refs (For primary document see N82-25149 15-99)

Avail: NTIS HC $60.50/MF $60.50 CSCL 21/8

A microcomputerized system which continually monitors capacitor parameters and report the conditions to the program manager was developed. The heart of the capacitor evaluation system is an Intel Corporation 8080A microprocessor. This device controls the capacitor charge and discharge cycles, acquires pertinent data regarding the capacitor's health, makes decisions for future actions based on the acquired data, and monitors the test experiment's facility status to ensure a safe operation. The system operates in an unattended mode. The capacitor charging is accomplished by high voltage laboratory supplies. Once charged, the capacitor is discharged through an ignition tube and a load simulator which approximates the actual pulse plasma thruster electrical characteristics. Temperature, voltage, leakage current, capacitance, and dissipation factor data are acquired by the microcomputer, and certain control decisions are made based on the values of these data. Author

N82-25167# California Univ., Livermore. Lawrence Livermore Lab.

ADDITIVE EROSION REDUCTION INFLUENCES IN THE TURBULENT BOUNDARY LAYER **c28**

A. C. Buckingham *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 2 May 1981 p 325-340 refs Sponsored in part by Army (For primary document see N82-25149 15-99) (Contract W-7405-eng-48)

Avail: NTIS HC $60.50/MF $60.50 CSCL 21/9

Results of a sequence of flow, heat and mass transfer calculations are presented which theoretically characterize the erosive environment at the wall surface of refractory metal coated and uncoated gun barrels. The theoretical results include analysis of the wall surface temperature, heat flux, and shear stress time histories on thin (10 mil. or 0.254 mm) Cr, Mo, Nb, and Ta plated steel barrel walls as uncoated steel walls. Solid particle additive concentrations, gas wall thermochemical infuences, and transient turbulent wall boundary layer flow with mutli-component molecular diffusion and reactions from interaction of propellant combustion and the eroding surface are discussed. The boundary layer model includes particulate additive concentrations as well as propellant combustion products, considered for the present to be in the local thermochemical equilibrium. In this way estimates are developed on the influence of the chemistry in the absence of information of specific kinetic rates for hypothesized gas/surface reactions. Author

N82-25168# Ballistic Research Labs., Aberdeen Proving Ground, Md.

RELATIVE EROSIVITY OF NITRAMINE, TRIPLE BASE, AND DOUBLE BASE PROPELLANTS **c28**

R. P. Kaste, I. C. Stobie, J. R. Ward, and B. D. Bensinger *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 2 May 1981 p 341-358 refs (For primary document see N82-25149 15-99)

Avail: NTIS HC $60.50/MF $60.50 CSCL 21/9

A series of nitramine, triple-base, and double-base propellants in lots with flame temperatures of 2,700, 3,000 and 3,300 K were tested or relative erosivity in vented chambers. Results suggested the 2,700 K nitramine was more erosive than other 2,700 K propellants, but the higher-flame temperature nitramines seemed no more erosive. The erosivity of the nine propellants was remeasured with a smaller diameter nozzle to increase mass loss per round. The results with the smaller diameter nozzle confirmed that the nitramines were no more erosive than the other propellants with the same flame temperatures. Author

N82-25169# Ballistic Research Labs., Aberdeen Proving Ground, Md.

EROSIVITY OF LOVA PROPELLANTS **c28**

J. R. Ward, T. L. Brosseau, R. P. Kaste, I. C. Stobie, and B. D. Bensinger *In* APL The 1981 JANNAF Propulsion Meeting, Vol. 2 May 1981 p 359-378 refs (For primary document see N82-25149 15-99)

Avail: NTIS HC $60.50/MF $60.50 CSCL 21/9

The erosivity of a series of LOVA propellants was evaluated with the BRL 37 mm blowout gun and with heat input measured in a 105 mm M68 tank cannon. The results in the 37 mm blowout gun suggested that three of the eight propellants were as erosive as M30. Subsequent review of the closed bomb data used to calculate charge weights indicated that it is likely the extraordinary erosivity of these three propellants was caused by overestimating the propellant needed to match peak pressure of M30. Heat input measurements in the 105 mm tank gun showed that the six LOVA propellants tested were all less erosive than M30. The least erosive propellant was a mixture of RDX with a KRATON binder. Two propellants (80% RDX-PU and 80% HMX-CTBN) had heat inputs greater than the M735 with a TiO2 wax liner. If either of these two propellants are selected for further evaluation, a wear reducing liner should be considered. The remaining propellants gave sufficiently low heat inputs that an additive is probably not needed. Author

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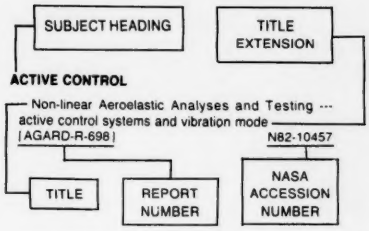

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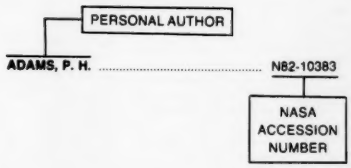

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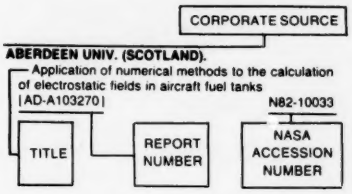

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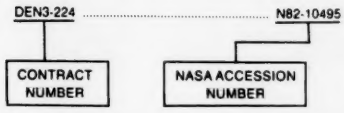

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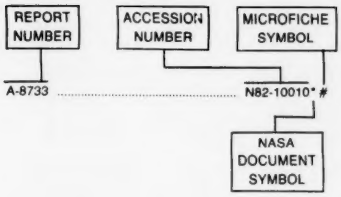

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